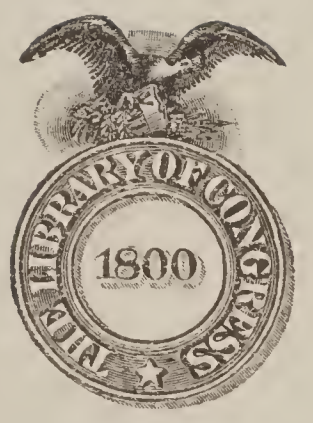

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A COMPARATIVE STATEMENT

OF

PHYSICAL VALUATION AND CAPITALIZATION

PREPARED BY THE

BUREAU OF RAILWAY ECONOMICS

LOGAN G. McPHERSON
DIRECTOR

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WASHINGTON, D. C.
1911

PHYSICAL VALUATION AND CAPITALIZATION.

INTRODUCTION.

An attempt has been made in this study to compare as accurately as possible the physical value and the capitalization of steam railways in the states in which official valuations have been made, that is, in the states of Washington, South Dakota, Michigan, Minnesota and Wisconsin. The state of Texas is considered only casually for reasons which appear in the discussion. It should be noted that in every case the statistics pertaining to value cover only physical properties. No attempt has been made to secure intangible value, which, as a matter of fact, has been arrived at only in one or two instances by State Commissions. The omission of intangible value should be held in mind in comparing physical value and capitalization, for it is at least an open question whether intangible value may not properly be capitalized.

The most significant question involved in the method of physical valuation is the manner in which right-of-way and terminal value is obtained; in other words, whether or not the railway is to be allowed a value for its land greater than that of adjoining land. because the railway corporation must settle all damages created by its entry upon private property, and because it frequently must pay an enhanced price for the land which it purchases due to the knowledge on the part of the landowner that the railway must have it at any price. The methods of valuing such land, so far as they could be discovered, are given in the text. It will be observed that Washington, South Dakota, Michigan and Wisconsin make allowance for this added cost in estimating cost of reproduction, and that the Minnesota Railroad Commission while disapproving the method in principle, has nevertheless had a valuation prepared upon this basis. In this connection, it should be noted that the valuations of both Michigan and Wisconsin were made for taxation purposes.

Assignment of capitalization to the different states has been made upon the single track mileage, that is, upon the road mileage basis. While this is not the most scientific basis, it is the only practicable one which could be employed, for statistics are in most cases not available for an assignment upon any other plan. With a few notable exceptions, the commissions of the different states present only incomplete and undigested statistical matter in their annual reports.

It is necessary to call attention at this point to a matter of technical detail which becomes, in its application, of very considerable

importance. Some of those who have already published comparative statements of value and capitalization have made assignments of capitalization to states upon an erroneous basis. It has apparently been the practice to find the ratio of the aggregate mileage within the state to the total mileage of all the systems traversing the state, and then apply this percentage to their total capitalization to determine the state's proportion of capitalization. This method is simple, but it leads to erroneous results, because it applies to a series of different capitalizations an average percentage, which, as a matter of fact, is applicable to no one of them. The only correct method is to determine the capitalization of each road separately on the mileage pro-rate basis, and then add the results together to obtain the aggregate of state capitalization. This latter method has been followed in this presentation.

So many errors have been discovered in the statistical tables prepared by the State Commissions that these reports have not been relied upon in most cases for total mileage or total capitalization. The Statistics of Railways of the Interstate Commerce Commission has been generally used.

In attempting this comparison of physical value and capitalization, many difficulties have arisen which could not be entirely removed.

1. In the first place, when the valuation has been made by a body other than the railroad commission, it has been difficult to identify in every case the corporation whose property was valued, and to assign to such corporation its proper capitalization. Roads reporting their capitalization to the Commission are as a rule the operating roads, while the roads are valued under their corporate names whether operating or not. Adjustments have in some cases been necessary, but these adjustments have in no case affected the conclusions drawn.

2. As a result of the intercorporate relationships of the various railways, the aggregate capitalization, even within the limits of a single state, contains more or less duplication. This duplication it has been the purpose of this study to eliminate as far as possible. The most striking case which has been encountered is in Minnesota, where not only is the capitalization of the Chicago, Burlington & Quincy included, but at the same time there is embodied the Great Northern's share of the $215,000,000 bond issue with which the C. B. & Q. stock was purchased. Moreover, in eliminating such duplications, this study has followed the practice of the Statistician of the Interstate Commerce Commission, who eliminates collateral trust bonds before computing funded debt per mile for the individual

railway corporations. All collateral trust bonds have been eliminated from the aggregate capitalization of the individual road before its stock and bonds have been assigned to the various states. In the same manner, bonds of proprietary companies have been deducted when these proprietary companies appear separately with their own capitalization. A third form of duplication has been corrected by deducting securities held in the treasury. It is evident that securities for which no value has yet been received cannot properly be included in a study which compares capitalization and physical value. Again, securities held in sinking funds have been eliminated from total capitalization. Appropriations to the sinking fund are merely appropriations for the retirement of debt, and the statement that securities are "kept alive" in a sinking fund is largely a fiction. Finally the total capitalization is increased beyond its proper size for comparison with physical value by the fact that it is frequently issued to cover "other properties" than railways. Railways are frequently engaged in business other than transportation and no distinction is made between securities issued for transportation and those issued for miscellaneous purposes. So far as it has been possible, capital issues covering "other properties" have been eliminated, but to do this adequately would have required a more extended investigation than was possible at this time. Hence, it is probable that a considerable amount of capitalization is included in the comparative tables which might properly be eliminated because it does not represent railway property. Even with all these deductions there are doubtless other duplications which might be eliminated were a careful study made of the purpose for which capital stock was issued by the various roads, yet it must be clear from the eliminations which have been made that the object is to set up against physical value the securities outstanding in the hands of the public upon which corporations are entitled to earn.

3. It is evident that an allocation of capitalization upon a mileage pro-rate basis is not an accurate figure for a comparative study of this character. It does more than justice to some states and less than justice to others. A state like South Dakota with most of its mileage single track and with no valuable terminals gets on a mileage pro-rate far more than its proportion of the capitalization of the roads which operate within its borders, for there is credited to the state a portion of the capitalization which belongs to valuable properties located elsewhere. On the other hand it is possible that the capitalization of the Washington railways should be increased beyond the amount allotted on a mileage pro-rate if correct results are to be obtained. An illustration of the inaccuracy of this method

is found in Wisconsin where the Illinois Central with nothing but branch line mileage in the state and no valuable terminals has its capitalization assigned to the state on a road mile basis. This difficulty is inherent in the situation. It only serves to make clear the proposition that if railways are to be valued at all they should be valued as units and not piecemeal by the separate states.

From what has just been said it must be clear that such a comparison as is presented in this study cannot be conclusive. It has been made in the hope that some degree of accuracy might be reached in a subject which has received of late much inaccurate treatment.

WASHINGTON.

The source of information for the valuation of Washington railways is the "Findings of Fact" of the Railroad Commission of Washington published in 1909. The results of these findings were embodied by Mr. J. C. Lawrence of the Washington Commission, in an article in the Railway Age Gazette of February 18, 1910, from which the facts here given were derived. Commissioner Lawrence in this article discusses the methods employed in the valuation of Washington railways, and it will be of interest to quote from his discussion before presenting the statistical results:

> The cost of reproducing right-of-way and terminals was estimated on the basis of market value of adjacent property, plus the additional amount experience has shown a railway company must pay for consequential damages in securing such property. * * *
>
> The unearned increment was allowed in the cost of reproduction. This may be either in the cost of construction of roadbed, structures and equipment or in the right-of-way and terminals. To fail to allow such increased value would be as unfair to the public as to the railways. Take for instance the terminals of an established road in an important city which were acquired at a low value, say for a million dollars; a new line is constructed and, to acquire its terminals contiguous to and of equal value to that of the established road, pays, say $10,000,000. If the latter road were not allowed the value it paid then it would be deprived of a return on the amount actually and necessarily invested in acquiring its property, and in that way deprived of the property itself, for the value of the use of the property is in reality the property itself. If this value were allowed to the latter road and denied to the former, then traffic tributary to the one would have an advantage over the other, and the construction of additional and competing roads would be discouraged. * * *
>
> The Commission concluded that on an established road, maintained to a proper standard of efficiency, there would be no continuing depreciation; that on a newly constructed line there would be a rapid depreciation of certain elements during the first few years. This would apply particularly to ties, and, in a lesser degree, to wooden structures and equipment. On the other hand, there would be an appreciation of roadbed on a new line, due to the seasoning and hardening which follows its use, attributable not only to set-

tling of embankments, thus rendering the condition of the roadbed more permanent and safe, but to the necessary labor involved in raising and widening embankments, cleaning out and widening cuts, safeguarding them from slides and remedying the defects occurring in construction and the contingencies which necessarily follow. Such appreciated value of roadbed would largely affect the depreciation in the value of the other items.

The appreciated value of the roadbed was added to the estimated cost of reproduction new, and from this sum deductions were made to cover the depreciation of all other items. * * * But the depreciated value of a road in profitable operation does not equal its market value. To this depreciated value must be added a sufficient amount to cover the enhanced value due to building up a successful transportation business. It is inconceivable that the value of such a business enterprise under efficient management should depreciate from a market standpoint.

In his discussion of "market value" Mr. Lawrence considers such influences as prices of outstanding securities, density of population, amount, permanency and class of traffic, and value of facilities for doing business.

In view of the fact that the Washington Commission has not made any statistical summary of its findings, it has been somewhat difficult to determine whether the entire mileage of the state was valued and what was the length of mileage actually included. In a personal letter under date of December 18, 1910, Commissioner Lawrence writes that the valuation included in their "Findings of Fact" of 1909, covers "the railway mileage in existence at the time of the creation of the Commission, June, 1905, approximating 3,300 miles. Since that date the mileage has been increased to a little in excess of 5,000 miles and the Commission is now engaged in valuing this new construction."

Yet from the tabular summary presented in the article referred to, the Commissioner seems to account for only 3,016 miles, and this figure has been used in presenting the per mile of line valuations in the table below. In view of the fact that the valuation included only the mileage in existence in 1905, it has been necessary to use the 1905 capitalization as a comparative figure. It has not been found possible to present statistics of capitalization for the exact mileage involved in the physical valuation, but the figure employed, 3,167 miles, is so nearly identical that the worth of the comparison is not destroyed.

Washington—Physical Valuation and Capitalization.

Physical value (1905-08):	Total.	Mileage.	Per mile.
Cost of reproduction new	$194,057,240	3,016	$64,343
Present value	175,797,025	3,016	58,288
Market value	195,662,635	3,016	64,875
Capitalization	168,696,670	3,167	53,267

SOUTH DAKOTA.

At the time that this study was made, the report on physical valuation for the state of South Dakota had been completed but had not yet been published. Such information as is here given was obtained by correspondence.

In valuing railway lands the Commission used the multiple of 250 per cent as an average, and applied it to all farm and city lands traversed by the roads; that is, it estimated railway land to be worth two and one half times that of adjoining land.

The number of miles valued was 3,953. Although the Commission dated its valuation June 30, 1909, it appears that the valuation was begun under an act of 1907, and that much of it had been completed before January 1, 1909. A more accurate comparison of actual conditions would probably have been made had capitalization figures been used for 1908 instead of 1909. However, the 1908 figures have been employed in the case of but one road, the Chicago, Milwaukee & St. Paul of South Dakota, and this was because its intercorporate relationships with the parent company were not fully adjusted on June 30, 1909.

South Dakota—Physical Valuation and Capitalization.

Physical value 1908:	Total.	Mileage.	Per mile.
Cost of reproduction new	$160,494,503	3,954	$26,933
Present value	91,695,132	3,954	23,190
Capitalization	138,850,297	3,954	35,116

MICHIGAN.

The original appraisal of the physical properties of Michigan railways was conducted in 1900-01, under the direction of the Board of State Tax Commissioners. Since that time the Tax Board has annually presented a table of assessed value of railway property, which by law must be an assessment at what the Board considers the actual value of the property, that is, a 100 per cent assessment. The assessed value is doubtless intended to correspond with "present value" as determined by the original valuation. Yet the Tax Board in its annual presentation of assessed value omits figures of cost of reproduction new, gives no table of mileage valued but merely the name of each corporation, and gives no indication that a genuine investigation of railway values has been made. This leads to the inference that no valuation of railway property has been attempted in the state of Michigan since the original valuation by Professors Cooley and Adams. It has seemed best, therefore, to include a comparative statement of valuation and capitalization for the year

1900, as well as the incomplete statement for 1907. In cases where capitalization could not be found for corporations listed in the report of the Tax Commissioners, the assessed value of such corporations has been deducted from the total in order that the statement presented might be properly comparative.

The method of valuing right of way and terminal lands is described as follows by Professor Cooley in his report to the Michigan Board of State Tax Commissioners:

> The question whether the increased cost of right of way over and above the value as determined by contiguous property may properly be included in the present value of a railroad, is a matter about which there may be a difference of opinion. The true cash value of a thing has been defined as the price upon which a purchaser and a seller mutually agree, and at which an actual transfer takes place. If an attempt were made to purchase an existing right of way, as, for example, an entrance into a city, if the owner were willing to sell at all he surely would take into consideration what it would cost the purchaser to get into the city by any other route, and the prospective purchaser would surely consider what it would cost him by another route. The conclusion finally reached was to add to the value of the right of way, as determined by contiguous property, an amount fairly representing the additional actual cost to the railroad.

Michigan—Physical Valuation and Capitalization.

Physical value 1900:	Total.	Mileage.	Per mile.
Cost of reproduction new	$202,716,262	7,813	$25,946
Present value	166,398,156	7,813	21,298
Capitalization	291,605,232	7,813	37,323
Physical value 1907:			
Present value	204,033,500	8,343	24,456
Capitalization	357,555,907	8,343	42,857

MINNESOTA.

The State of Minnesota has recently completed a most exhaustive physical valuation of railways as of June 30, 1907. This report requires little comment as the very complete statistical presentation explains itself. As already noted, the valuation was made on two different bases, described below as Estimate A and Estimate B. In Estimate A, allowance is made for the price which railways would have to pay for the land for railway purposes, including damages and monopoly prices for land. In Estimate B, land is valued on the same basis as land lying in contiguous territory. The Minnesota Commission contended for the valuation represented by Estimate B, the railways maintained that Estimate A was the fairer one. In this connection, reference should be made to the basis employed by the states of Washington, South Dakota, Wisconsin and Michigan.

The capitalization figures are those for June 30, 1907. The

considerable reduction in the capitalization figure below that commonly quoted for Minnesota is due to the elimination from the Great Northern's capitalization of $107,000,000, being its proportion of the Chicago, Burlington & Quincy collateral 4's issued jointly by the Great Northern and Northern Pacific. In view of the fact that the Chicago, Burlington & Quincy capitalization is already included in the total capitalization of Minnesota railways, it is an obvious duplication to include in the capitalization of the purchasing company any part of the bonds with which the Burlington stock was purchased.

**Minnesota—Physical Valuation and Capitalization.*

	Total.	Mileage.	Per mile.
Physical value, 1907, Estimate A:			
Cost of production new—			
Carrying roads	$397,299,471	7,577.71	$52,430
Switching roads	14,435,724	18.72	770,933
Total	411,735,195	7,596.43	54,201
Present value:			
Carrying roads	347,051,336	7,577.71	45,799
Switching roads	13,428,824	18.72	717,160
Total	360,480,160	7,596.43	47,454
Physical value, Estimate B1:			
Cost of reproduction new	373,820,141	7,596.43	49,210
Present value	322,565,107	7,596.43	42,463
Physical value, Estimate B2:			
Cost of reproduction new—			
Carrying roads	350,106,321	7,577.71	46,202
Switching roads	10,855,227	18.72	579,718
Total	360,961,548	7,596.43	47,517
Present value:			
Carrying roads	299,858,186	7,577.71	39,571
Switching roads	9,848,327	18.72	525.945
Total	309,706,513	7,596.43	40,770
Capitalization:			
Carrying roads	292,299,292	7,577.71	38,574
Switching roads	7,728,404	18.72	412,732
Total	$300,027,696	7,596.43	$39,496

*Estimate A includes multiples on lands for right of way, yards and terminals, and allowance for adaptation and solidification of roadbed. Estimate B1 omits from Estimate A multiples on lands for right of way, yards and terminals. Estimate B2 omits from Estimate A multiples on lands for right of way, yards and terminals, and allowance for adaptation and solidification of roadbed.

WISCONSIN.

The appraisal of the physical properties of Wisconsin railways is in charge of the Wisconsin Tax Commission, and is made primarily for taxation purposes. The original appraisal was made as of June 30, 1903, and annual revisions thereof have been made through the medium of reports by the railways to the Engineer of the Commission. The last report just received is dated June 30, 1909.

Concerning the method of valuing right of way and terminals, Professor W. D. Taylor, then Engineer of the Commission, made the following statement in a report to the Commission dated January 2, 1905:

> To determine the value of the land in the present right of way, such lands must be deemed as belonging to the owners of the adjoining lands and to be acquired by negotiations with such owners or under the power of eminent domain, whereby the owners are entitled to just compensation for the land actually taken and for depreciation in the market value of the residue in consequence of the railroad crossing the part taken. In ordinary language, the inquiry will be first, what is the fair average market price per acre for ordinary purposes of the land taken, and second, how much is the depreciation in the salable value of the residue of the parcel, lot, or tract with the buildings thereon from which the right of way is severed. The sum of the two items, first, the market price of the land taken, and the second item, depreciation in the salable market value of the residue, will constitute the right-of-way value.

The figures of total capitalization are those reported by the railways to the Wisconsin Railroad Commission on June 30, 1909. The Tax Commission has valued a number of private unincorporated roads, which have no capitalization. The valuations of these roads have been omitted from the table presented herewith in order to make the comparison more accurate. The mileage figure used in computing capitalization per mile could not be made to agree exactly with the mileage valued but the discrepancy of 39 miles is not sufficient to disturb the general conclusions.

Wisconsin—Physical Valuation and Capitalization.

Physical value 1909:	Total.	Mileage.	Per mile,
Cost of reproduction new	$296,803,322	7,098.70	$41,811
Present value	240,718,711	7,098.70	33,910
Capitalization	311,819,128	7,060.00	44,167

TEXAS.

The Texas Railroad Commission estimates the total value of railroads in that state up to October 31, 1909, at $212,794,586 or $17,198 per mile of line. The aggregate capitalization on June 30,

1909, including equipment trust obligations and current liabilities, is given as $420,031,677, or $31,910 per mile of line. These two totals have often been compared and conclusions have been drawn from them unfavorable to the methods of railway capitalization. Yet a moment's consideration will show that the two totals have no relation to each other whatever. By the Stock and Bond Law of April 8, 1893, the Railroad Commission was instructed to value the property of the various railroads as a preliminary to the approval or disapproval of the issue of additional securities. Valuations were made immediately of all roads then in existence and changes in the aggregate value of Texas railroads since that time have occurred only when new lines have been constructed. In other words, the valuation now so frequently quoted was made in 1894-6, when, following the panic of 1893, land, right-of-way, terminal facilities and construction materials were at their lowest prices. To present that original value as the present value of Texas roads, as the Commission has done, is to refuse to give the roads any credit for permanent improvements, for the general settling and seasoning of their properties, or for the advance in value due to the general growth of the community to which the railroad has largely contributed.

Whatever may have been the degree of overcapitalization in 1894, no comparison of an 1894 valuation with a 1909 capitalization can have the slightest validity. From 1896 to 1909 there was an increase in the Commission's valuation of Texas roads per mile of line of only 9.3 per cent. That this increase does not at all represent the actual increase in investment in Texas roads is shown by a study of gross earnings. Taking an average of the three years 1894-6 as a base, and comparing this with an average for the three years 1907-9 there is found to be an increase in gross earnings per mile of road in Texas of 71.8 per cent. At the same time, capitalization (stocks and bonds) per mile actually decreased 22.24 per cent between 1896 and 1909.

Mr. Charles S. Potts, Professor of Law in the University of Texas, in his monograph on Railroad Transportation in Texas, expresses the opinion that if a thorough revaluation were made of Texas roads, the margin between actual value and capitalized value would be wiped out in the case of many roads. He quotes Mr. R. A. Thompson, for many years chief engineer of the Texas Railroad Commission, in a hearing before the Interstate Commerce Commission, as asserting it to be his deliberate opinion that the physical property of Texas railroads, valued by the Commission at $17,000, was worth on an average $30,000 per mile of line.

It is of interest to observe that the Texas Railroad Commission in its more recent valuations has placed a higher value per mile upon railway property than in its earlier valuations. Between 1894 and 1896, forty-five roads with a mileage of 9,105 miles were valued at an average of $15,589 per mile. Between 1905 and 1909, thirty-seven roads, with a mileage of 1,678 miles, were valued at $22,227 per mile.

It is significant that the Texas Tax Board in 1908 estimated the total value of railroad property, tangible and intangible, as $409,957,928 or $31,776 per mile of line. This board in its estimate includes all those elements of value which are omitted by the Railroad Commission.

For the reasons given, all figures for Texas are excluded as worthless from the summary table at the end of this discussion.

RECAPITULATION

STATE	PHYSICAL VALUE				CAPITALIZATION	
	COST OF REPRODUCTION		PRESENT VALUE			
	Total	Per Mile	Total	Per Mile	Total	Per Mile
Washington, 1905*....	$194,057,240	$64,343	$175,797,025	$58,288	$168,696,670	$53,267
South Dakota, 1908...	106,494,503	26,933	91,695,132	23,190	138,850,297	35,116
Michigan, 1900.....	202,716,262	25,946	166,398.156	21,298	291,605,232	37,323
1907.... ...	.....	.....	204,033,500	24,456	357,555,907	42,857
Minnesota, 1907—						
Estimate A	411,735,195	54,201	360,480,160	47,454	300,027,696	39,496
Estimate B 1	373,820,141	49,210	322,565,107	42,463	.. . .	.....
Estimate B 2	360,961,548	47,517	309,706,514	40,770	.....	.....
Wisconsin, 1909.....	296,803,322	41,811	240,718,711	33,910	311,819,128	44,167

*In Washington, a *market value* of $195,662,635, or $64,875 per mile, is also given.

It should be kept clearly in mind by any one who uses the figures given in this pamphlet that this is not, and is not intended to be, a definite or an absolutely accurate statement of the relation of physical value to capitalization. Its purpose is to point out the difficulties of comparison of these two items within the limits of single states, and to resolve these difficulties so far as available statistics will permit. Further investigation would make possible the production of a multitude of illustrations of the injustice to the railways in most of these western states of the mileage pro-rate method of capital distribution. Although the figures given are those of physical value only, strong arguments might have been advanced

for the capitalization of intangible values. But this pamphlet was not designed as a discussion of the principles which should apply in a valuation of railways, nor as an exhaustive discussion of the statistical elements involved.

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Comment on the Decision

IN THE

Western Advanced Rate Case

No. 3500

Bulletin No. 11

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BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

1. Summary of Revenues and Expenses of Steam Roads in the United States for July, 1910. (Monthly Report Series, Bulletin No. 1.)

2. Summary of Revenues and Expenses of Steam Roads in the United States for August, 1910. (Monthly Report Series, Bulletin No. 2.)

3. Summary of Revenues and Expenses of Steam Roads in the United States for September, 1910. (Monthly Report Series, Bulletin No. 3.)

4. A Comparative Statement of Physical Valuation and Capitalization.

5. Preliminary Bulletin for November, 1910—Revenues and Expenses.

6. Railway Traffic Statistics.

7. Summary of Revenues and Expenses of Steam Roads in the United States for October, 1910. (Monthly Report Series, Bulletin No. 4.)

8. Summary of Revenues and Expenses of Steam Roads in the United States for November, 1910. (Monthly Report Series, Bulletin No. 5.)

9. Summary of Revenues and Expenses of Steam Roads in the United States for December, 1910. (Monthly Report Series, Bulletin No. 6.)

10. Summary of Revenues and expenses of Steam Roads in the United States for January, 1911.

11. Comment on the Decision in the Western Advanced Rate Case, No. 3500.

The numbering of the monthly bulletins as a separate series was abandoned with the December issue. Since then all bulletins issued by the Bureau have been given a consecutive number only.

COMMENT ON THE DECISION

IN THE

WESTERN ADVANCED RATE CASE.

No. 3500.

It is the purpose of this pamphlet to examine the arguments upon which rests the decision in the case, and to some extent the statistics upon which the arguments are based. It will therefore be helpful to analyze the opinion into its main divisions and consider the statistical bases and the arguments of each section together. It may be said that the purpose is not to discover inaccuracies in statistical detail when such inaccuracies do not affect the conclusions. Rather is it the purpose to determine whether figures have been improperly used, or whether important data have been left out of consideration.

1. (pp. 2–10) *The Legal Basis.*

The conclusion that the carriers must satisfy the mind of the Commission that the new rates are reasonable is purely legal and does not rest upon statistics. The nature of the subsequent statistical findings, however, affects the significance of this section.

NOTE: Comment has been confined to the Western case because there are no points in the Eastern case requiring special attention that are not duplicated in the Western decision. The statistics have not been exhaustively checked. The figures of one road, the Chicago, Burlington & Quincy, have been carefully examined and the results obtained have been considered as typical with regard to the other roads. In other respects the statistics have been only roughly checked and only in cases where they had some direct bearing upon the argument. This pamphlet has been prepared for the information of the members of the Bureau, and has not been published in sufficient quantity for general distribution.

Inasmuch as the roads did not succeed in convincing the Commission that the cost of transportation had seriously increased, it is of no consequence that the Commission considered the *reasonableness of the advanced rates* rather than the *justification of the advance* in the rates, for the general financial condition of the carriers had to be considered whichever way this legal question was decided, so long as the increased cost of doing business was not successfully proved. If the carriers had shown an increase in their "cost of living" that impressed the Commission, then a restriction of the whole case to the *justification of an advance* would have benefited the position of the railways.

2. (pp. 10–12) *The Benefits of Regulation.*

The statistics quoted in this connection (page 12) may be criticised in that 1901 is not the dividing point between regulation and laissez faire. Why should these benefits be claimed for "regulation" rather than for the natural consolidations of railways? Legislation did everything it could to foster competition. Furthermore, it is said that net revenue per mile between 1901 and 1910 increased 50%. The table shows an increase of only 33%. Even if we compare 1910 with 1900 instead of with 1901, as more accurately representing a ten year period, the percentage would fall short of 50. This error doubtless arose from the fact that in comparing $2,951 and $3,913 attention was paid only to the *2* and *3* which differ by 50%. There are other examples of carelessness through expressions in round numbers. On page 52, for example, 70% is used for 61.9%, and 25 for 28%; and 30% is used for 26.5% on page 51.

In the table on page 12, the figures will be found to differ somewhat from those given under corresponding heads in the Statistics of Railways, but this is due to the adjustments necessary to make the years prior to 1908 comparable with 1908, 1909 and 1910 under the new classification of operating revenues and expenses.

It is not necessary to discuss these adjustments, as the amount of the changes from the original figures could not affect the argument.

3. (pp. 12–19) *Railway Prosperity.*

The table on page 12 is used to indicate a general prosperity among railways. The method of using the figures is open to criticism. The statement that the net revenue increased $300,000,000 in eight years and $109,000,000 in one year, does not necessarily mean anything more than that the transportation business is very large. To call net operating revenues "net profits" is misleading. The opinion (page 17) shows that the "net profits" were only $1,270,881 greater in 1910 than in 1909, which makes no allowance for new investment. Whether an increase in net operating revenues in a series of years is excessive can only be determined when it is taken in connection with the increase in investment, which is a subject not adequately considered in the opinion.

The table (page 13) showing the increase in dividends is taken from the annual reports of the Commission. It may be noted that the amount paid in dividends includes duplications resulting from intercorporate payments, but as the amount of stock paying dividends includes similar duplications, the average rate paid is probably not misleading on account of such duplications. Why the calculation of the rate should be restricted to dividend paying stock is not exactly clear. It apparently assumes that all non-dividend paying stock is water and should be ruled out of consideration. But some watered stock may pay a dividend and, on the other hand, some of the non-dividend stock may represent unprofitable but actual investment. A more enlightening method would be to print both the rate on dividend paying stock and the rate on *all* stock side by side.

Incidentally we may note that as the book by Judge Noyes was published in 1905, it can hardly be quoted as showing the situation to-day.

In the quotation from the London Statist, the figures seem to to be based upon Poor's Manual. It is said (page 16) that in ten years capital increased 41.5% and net receipts 79.3%. Capital is here used in the sense of capital stock. But the increase in net operating revenue should be compared with increase in total capitalization—that is, bonds and stock—and not with capital stock alone. In 1909 the total railway capitalization (gross) was reported to be (Statistics of Railways, 1909, page 55) $17,487,868,935, and in 1899, $11,033,954,898 (Statistics of Railways, 1899, page 56), being an increase of $6,453,914,037, or 58.5%. How much of this increase is net in the hands of the public and how much is intercorporate duplication, cannot be determined.

4. (pp. 19–23) *Railway Credit.*

In the main, the statistics in this section appear to check both with the annual statistical volumes of the Interstate Commerce Commission and with the ten year summary statements prepared by the Commission for the several roads in this rate hearing. Here, again, there are quotations of large figures which really prove nothing. It may be true that our railways borrowed upon mortgages in one decade more than twice as much as the national debt at the close of the Civil War, but this tells us nothing as to how much should have been borrowed to provide adequate railway facilities. That six Western roads borrowed over $450,000,000—more than the United States Government estimated will be necessary to build the Panama Canal—carries no conviction concerning the issue in the case.

On page 19, the increase in funded debt is compared with the increase in mileage. These figures check with the Statistics of Railways, but it may be noted that the percent of increase in stocks and bonds together is not as great as for bonds alone. Railway credit involves both stocks and bonds. On page 21, the bonds of the Atchison, Topeka and Santa Fe are given as $380,000,000. This should be $300,000,000.

5. (pp. 24–28) *Increase in Surplus and Extent of Justification for Accumulation of Surplus.*

The statement is made (page 24) that the carriers of the United States have accumulated unappropriated surplus in 1909, amounting to $800,642,923, whereas in 1899, this surplus was but $194,106,367. These figures are from the balance sheet, under Profit and Loss, in the annual statistical volumes. The significance of these figures is considerably diminished by the opinion itself when it says that in the last analysis a surplus is a matter of bookkeeping. Very little of it is in the form of cash. "Most of it has been expended in one way or another for improvements placed upon the property out of the income of the carrier."

The table on page 25 is misleading because the word surplus is used in a different sense from that on the preceding page. The Chicago, Burlington and Quincy is said to have a surplus in 1910 of $72,592,760. This is not the surplus on the balance sheet, but is the "accumulated surplus brought forward from the preceding year," increased by the "net corporate income" for that year and by the "discounts on securities bought and sold and other profit and loss allocations," and represents a final total out of which must be paid dividends, additions and betterments, etc. The opinion does not seem to bring out clearly the difference between a surplus in the balance sheet, which is a fund, and a surplus in the income account, which is an annual flow. In its tabulations, the Commission appears to have assumed that a surplus balance carried forward from year to year could be expended every year. Thus, if we have a balance of $500,000 in the first of ten years and carry that forward each year without increasing it in subsequent years, the Commission would say that, on an average for the ten years, there was a surplus of $500,000 a year to spend for the stockholders; whereas, in reality, the amount available each year would be only $50,000.

The theoretical discussion regarding surplus is inconclusive and

seems to be nothing but a verbal quibble. In replying to Mr. Ripley's statement that the Santa Fe should pay 6 percent on stock with another 6 percent for non-productive improvements, the opinion says (page 27) that this could not be generally applied because the relative amount of stocks and bonds is not the same in various roads. In a straightforward discussion of the merits of this theory, the Commission should have said that in the case of the Atchison the stock is not far from one-half the total capitalization. To generalize the discussion, the question becomes, should permission be granted to expend 6% on one-half the total capitalization, in non-productive improvements?

It is said that the maintenance accounts of these carriers practically rebuild the road every ten years (page 28). The Chicago Burlington and Quincy spent for maintenance of way and structures in ten years approximately $13,000 per mile. Would this be sufficient to rebuild that road?

6. (pp. 29–39) *The Present Value of a Road as a Basis for Earnings.*

The conclusion of this section does not rest upon statistics. The logic is not convincing. The opinion says, "Our position is that a railroad may not increase rates upon shippers, for the reason and as an outgrowth of the fact that it has accumulated out of rates a balance of profit which has been invested in the property" (page 34). And again, "If the theory is to be recognized that by increasing the value of their property by putting back operating revenue into the property, a carrier may, as a legal right, increase rates, then the shipper is worse off each time he pays a rate which allows a revenue over and above a reasonable return upon the original investment" (pp. 34–35).

There is confusion here. Whether a rate is just or not is one question; what the carrier does with the proceeds of a rate allowed as legal, is another question. When the Interstate Commerce

Commission and the Courts have permitted a system of rates to stand as lawful, then the profits resulting from such rates belong to the stockholders. To choose to spend those profits for automobiles, is one way of disposing of them. If the stockholders forego the automobiles and provide additional shipping facilities, asking only a normal interest return upon the investment, is the shipper worse off? If, in the past, certain rate systems had been sanctioned with the understanding that a certain part of the profits therefrom should be set aside as a surplus for improvements never to be capitalized, the situation would have been different, but such a promise was never exacted from the railways.

Similarly in regard to the right to capitalize the increment in value due to the growth of the community. It might or might not be a wise policy for Congress to deny such a right in the future in the case of all or certain classes of business and farming enterprises, but no such denial is recorded. For the Commission to make such a ruling is to assume legislative powers, and to apply such a rule to past increments is bad faith.

In the table on page 37 (introduced by the Milwaukee road) there are minor discrepancies between the valuations there given for Minnesota and South Dakota and the figures found in other reports. In the text it is said that the Chicago, Burlington & Quincy was estimated in Wisconsin to have a value of $38,000 per mile *new*, and $32,000 per mile *present value.* The figures furnished to this Bureau by the Wisconsin Railroad Commission as of June 30, 1909, give the Chicago, Burlington & Quincy in Wisconsin a cost of reproduction new of $11,120,539, and for the existing condition a value of $9,117,445, with a road mileage of 223.14. This gives per mile figures of $49,836.59 and $40,859.75 respectively.

Regarding the estimated cost of constructing a main line in Kansas, it may be noted that there has apparently been no allowance for seasoning. It is understood that the Chicago, Milwaukee & Puget Sound does not begin passenger travel over its road until

two years after original construction, because of the unsafe condition of the road in its first months of existence.

The tables on page 39 are hypothetical. Is not 4% too low an estimate of the cost to railways of interest on bonds? The valuations of $40,000 and $36,000 per mile for the Burlington are open to question. Furthermore, the "return" is simply operating income less interest on bonds, with no allowance for reserve, rents, sinking funds, etc.

7. (pp. 39–62) *Reasonable Rates and Cost of Service.*

The power of the traffic manager is doubtless somewhat overestimated in this discussion. He is limited by the fact that even to-day he does not have an absolute monopoly in all his territory. There are still competing centres of production and sale. The discussion is significant in the emphasis which is laid upon cost of service. The use made of the cost figures submitted by the various railway companies is not always consistent. Thus on page 50, it is recognized that although these figures "may not be sufficiently definite as to be authoritative upon the cost of carrying traffic, they clearly and unquestionably show the relative cost from year to year, because the same system of book-keeping and statistical accounting obtains throughout these periods of time." Yet on page 53, these cost figures are compared directly with the revenue per ton mile, and the question is asked why the cost on one road is greater than on another. The fact that the ton mile revenue on the Burlington is stated to have been 8.5 mills when the ten year statement compiled by the Commission shows it as 7.83 mills, is an error of no moment because the quotation of the ton mile rate at this point is itself absurd. These costs are not total costs, but simply operating costs. On page 50, it is said: "Cost, it will be noted, includes all operating expenses and taxes; not merely the cost of running a train over a track," which tends to give the reader the impression that these statistics covered the whole cost of furnishing the service.

In the discussion of the Milwaukee's statement of cost, we find an indorsement of Mr. Acworth's formula regarding fixed and variable expenditures, with no recognition of the fact that this formula holds only within certain limits. It is said: "Certain expenses—for instance, maintenance of works—hardly increase at all" as the traffic increases. But we know after a certain density of traffic is reached a tremendous expenditure may be incurred for additional terminals, because of increased traffic. This fact receives distinct recognition in Mr. Prouty's opinion. That the Commission did not read this part of the text carefully before sending it out is shown by the fact that the algebraic formula is incorrectly quoted, although the typographical error which appears in the original is faithfully reproduced. Mr. Acworth's book gives it as $\frac{1}{2}x+(\frac{1}{2}x+5)=3x$ which should be $\frac{1}{2}x+(\frac{1}{2}x\times 5)=3x$. In the statistics of expenditures quoted in this section there are no discrepancies worth mentioning.

8. (pp. 62–69) *Six Months' Comparison.*

These tables have been checked only with respect to the Chicago, Burlington & Quincy. Only slight discrepancies appear. But it is doubtful whether the combined table on page 69 showing operating income, justifies the tone of "How much more are these railroads entitled to for the same service in the year 1911 than they were in 1910 or 1909?" In two of the roads there was a decline in the last six months of 1910, as compared with the same period in 1909, and that more of them do not show a decline is perhaps explained in part by the abnormally poor weather conditions of the latter part of 1909. Three of these roads show decreases in the first half of 1910 as compared with the same period of 1909. The monthly bulletin of the Bureau shows that a more comprehensive view of *Western* roads gives a *decrease* per mile of line for both halves of 1910 (calendar year) as compared with corresponding periods of 1909, the percent of decrease for the first half being 1.1 and for the second 3.7.

9. (p. 69) *The Poorer Roads.*

The question may be asked why the most prosperous roads should be made the standard rather than the poorer roads, or why some average between the two extremes should not be taken.

10. (p. 70) *Conclusion.*

Much more attention appears to have been paid to statistics of operating revenues and expenses than to a detailed study of the needs of the railways in the way of extensions and improvements in the immediate future, which should show whether the rate of increase in these capital needs is justified by the extent to which net earnings will increase under present rates. Perhaps the carriers were at fault in not presenting adequate statistics upon this point, and perhaps, if such statistics had been presented, the result would not have been different. Perhaps the railways are really more prosperous than they thought, but certainly the statistics here reviewed are not an adequate presentation of the subject. It is to be regretted that there was not included in the exhibits a thoroughgoing study of railway economy which would show the exact relations between growth in revenues, traffic, and operating and capital expenditures.

BUREAU OF RAILWAY ECONOMICS

Established by Railways of the United States
for the Scientific Study of Transportation Problems

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The Conflict Between Federal and State Regulation of the Railways

Bulletin No. 15

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BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

1. Summary of Revenues and Expenses of Steam Roads in the United States for July, 1910. (Monthly Report Series, Bulletin No. 1.)
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9. Summary of Revenues and Expenses of Steam Roads in the United States for December, 1910. (Monthly Report Series, Bulletin No. 6.)
10. Summary of Revenues and Expenses of Steam Roads in the United States for January, 1911.
11. Comment on the Decision in the Western Advanced Rate Case, No. 3500. (Out of Print.)
12. Summary of Revenues and Expenses of Steam Roads in the United States for February, 1911.
13. Summary of Revenues and Expenses of Steam Roads in the United States for March, 1911.

(*Continued on third page of cover.*)

The numbering of the monthly bulletins as a separate series was abandoned with the December, 1910, issue. Since then all bulletins issued by the Bureau have been given a consecutive number only.

The Conflict Between Federal and State Regulation of the Railways

WASHINGTON, D. C.
JUNE, 1911

PREFACE.

A recent letter from Mr. Edwin A. Pratt, the English writer on railways, to the Director of the Bureau of Railway Economics, says:

> "I should very much like to have for the purposes of a work on which I am now engaged, a few facts as to the nature and extent of the control exercised by the various States—supplementing that of the Interstate Commerce Commission—on the railways of your country. At a meeting last night of the Political Economy Club, to which I was invited as a guest, a discussion was started on the subject during which the view was expressed that the control by the States was becoming so oppressive that it would be difficult for the country to avoid being forced into government ownership of the railways in the proximate future, and there was a very interesting debate thereon.
>
> "Would it be troubling you too much to favor me with a few details which would enable me to state the position clearly?"

In the thought that the statement prepared in response to Mr. Pratt's request may be of interest to the members of the Bureau, it is incorporated in this bulletin.

THE CONFLICT BETWEEN FEDERAL AND STATE REGULATION OF RAILWAYS.

For convenience of reference the provisions of the Constitution of the United States conferring and limiting the powers of Federal and State regulation of railways are set forth as follows:

> The Congress shall have power: * * * To regulate commerce with foreign nations and among the several States, * * *. Section 8, Article I.
>
> This Constitution, and the laws of the United States which shall be made in pursuance thereof, * * * shall be the supreme law of the land, and the judges in every State shall be bound thereby, anything in the Constitution or laws of any State to the contrary notwithstanding. Paragraph 2, Article VI.
>
> The powers not delegated to the United States, by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people. Amendment X.
>
> No person shall * * * be deprived of life, liberty or property, without due process of law; nor shall private property be taken for public use without just compensation. Amendment V.
>
> * * * nor shall any State deprive any person of life, liberty or property, without due process of law, nor deny to any person within its jurisdiction the equal protection of the laws. Section 1, Amendment XIV.

The effect of these provisions of the Constitution upon the power of the Federal Government and the States to regulate railways may be summarized as follows:

The Federal Government exercises delegated powers only; all powers not expressly delegated to it by the Constitution

or prohibited to the States may be exercised by the States. In the exercise of its delegated powers the Federal Government is supreme, but the power of a State over any matter as to which power has been delegated to Congress, is largely determined by the question of whether Congress has exercised its delegated power as affecting this subject-matter. If a Federal law is construed as regulating the whole of any subject-matter as to which power has been delegated to Congress or if State regulation conflicts with any Federal law, such State legislation is void. As the Federal Government is constantly exercising to a fuller extent the power to regulate interstate commerce, the necessary tendency is to restrict the powers of the States.

Under Section 8, Article I of the Constitution, exclusive power to regulate railway operations, practices and charges affecting the transportation of persons or property where, in the course of such transportation, State lines are crossed, is delegated to the Federal Government, the only restriction upon its power in this field being the provision of Amendment V that "No person shall be * * * deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use without just compensation." It follows that it is not within the power of Congress to impose regulations which shall have the effect of depriving the railway company of its property without due process of law or of taking its property without just compensation, and the United States Supreme Court has held that the use of property, in all legitimate ways, is as much a right of property protected by the Constitution as is the property itself.

The power to regulate commerce wholly within a State, not having been delegated to Congress, is reserved to the States, respectively, under Amendment X of the Constitution. This gives to each State plenary power over all commerce or transportation which begins and ends within its borders, subject, however, to the provision of Section 1, Amendment XIV, which provides that no State shall "deprive any person of life, liberty or property without due process of law; nor deny to

any person within its jurisdiction the equal protection of the laws."

As, with few and unimportant exceptions, the railways of the United States are engaged in interstate commerce as well as in intrastate commerce, it is inevitable, under our dual system of government, that questions should arise as to the exact location of the line separating the jurisdiction of the Federal Government from that of the several States. This is frequently illustrated by questions as to whether the effect of regulations imposed by State authority may be to regulate or burden interstate commerce. It is the duty of all of the courts, State and Federal, to determine questions that arise as to whether an act of Congress is made in pursuance of the Constitution of the United States; and as to whether any provision of a State Constitution, or any act of a State Legislature is in violation of any provision of the Constitution of the United States. The United States Supreme Court is the final tribunal on all questions of Constitutional construction.

As questions as to the extent of the regulative powers, both of the Federal Government and of the States, are constantly being presented to the United States Supreme Court, the decisions of this court are gradually defining more sharply the extent of the Federal and State powers, respectively, and drawing the dividing line between them more clearly. The tendency of the decisions of this court seem to be strongly in the direction of the proposition that interstate railways must, in all substantial respects, be subject to one power, and the court now manifests a more decided tendency than in former years to hold that regulations of intrastate commerce which have the effect of regulating or burdening interstate commerce, are void as trenching upon the power delegated to Congress to regulate commerce among the States. There are some apparent exceptions to this, as in cases in which it has been held that, under its police power, a State may prescribe regulations affecting the movement of interstate commerce so long as such regulations only indirectly affect interstate commerce and do not regulate or burden it. An illustration

of this is the enactment by a State prescribing tests for color-blindness for locomotive engineers engaged within that State in the operation of interstate trains.

While each State possesses exactly the same power as to matters within its jurisdiction as is possessed by each of the other States, this power has been used in as many different ways as there are States in the Union, with the result that every interstate railway, in addition to being subject to the regulations imposed by the Federal Government, is subject to a different set of regulations in each State which it traverses.

Some of the States have used only a small fraction of their power to regulate intrastate commerce; others have endeavored to go far beyond it and have been kept within bounds only by the courts.

State regulative power has been exercised in a variety of ways. In some cases specific regulations have been enacted by State laws, and in other cases they have been prescribed by commissions under power delegated by the State Legislatures. Regulations have been prescribed covering passenger and freight charges, train operation, car supply, character of equipment and station buildings, hours of labor of employees and conditions of employment, safety appliances, and almost every conceivable phase of railway operation.

State acts and regulations prescribing maximum charges for the transportation of passengers and freight have caused much of the litigation between the railways and the States, and have frequently been held to be unconstitutional on the ground that the charges prescribed were so low as to be confiscatory under the Fourteenth Amendment, that they would deprive the railway of a reasonable return upon the value of its property. It is the contention of some able lawyers that the courts must ultimately go farther and hold that under the Constitution of the United States, just as under the Common Law of England, the railway cannot be deprived by legislation of just and reasonable compensation for each specific transportation service; that small profits will not justify the making of a greater

charge, and that large profits will not justify a lesser charge being fixed by any governmental authority. It is contended that the right given to the railways by the present interstate commerce law to make a reasonable charge for each service is but the legislative expression of a Constitutional right.

In some of the States efforts have been made to prevent the railways from testing the validity of State regulations in the courts.

Minnesota, in a freight rate act, and North Carolina, in passenger and freight rate acts attempted to do this by prescribing such severe penalties for the violation of the acts as to force the companies to comply therewith rather than run the risk of failing to prove the invalidity of the acts in criminal prosecutions. The Supreme Court of the United States held all of these acts to be unconstitutional and void.

Alabama, Arkansas, and Missouri attempted to keep the railways out of the United States courts by statutes which provided that any corporation chartered in any other State which should resort to a United States court should forfeit its right to do intrastate business in that State. These laws were overthrown by the United States Supreme Court as denying to the foreign corporations equal protection of the laws.

Section 720 of the Revised Statutes of the United States, provides that "the writ of injunction shall not be granted by any court of the United States to stay proceedings in any court of a State * * *." With this provision in view, Virginia attempted to evade the jurisdiction of the United States courts by creating a Corporation Commission with the powers of a court and fixing railway charges by court decrees rather than by acts of a legislative nature. This failed to be sustained by the United States Supreme Court, as it was held that, in fixing railway charges, the Virginia Corporation Commission, notwithstanding its powers and its form of procedure, was exercising legislative power and not judicial power.

As would naturally be supposed, the States have been com-

peting with each other for the purpose of securing advantages of commerce within their respective borders over that of any other State and over interstate commerce. This rivalry has been strikingly manifested in laws and regulations affecting car service. These have generally been termed "reciprocal demurrage" laws and have been based on the false theory that a demurrage charge imposed by a railway bears a reciprocal relation to a legislative penalty for failure to provide a car when demanded by a shipper.

The natural effect of such laws in times of car shortage would be to compel an interstate road to discriminate in favor of intrastate commerce in the State imposing the highest penalties, as against intrastate commerce in other States and against interstate commerce. North Carolina has gone farther than any other State in legislation of this character, having enacted a law providing that, upon failure to provide a car within 48 hours after demand, the railway should pay $25.00 for the first day and $5.00 for each subsequent day, the penalty for failure to provide facilities for less than carload shipments being $12.50 for the first day and $2.50 for each subsequent day. Subsequent legislation reduced these penalties. It may be that if a State should go to such extremes in this direction as to create material discriminations against, or impose material burdens upon, interstate commerce, such penalty laws would be held to be unconstitutional and void.

It will be seen that the effect of the recent decisions of the United States Supreme Court and of the fuller exercise of the legislative powers of Congress have been to give a broad construction to the clause of the Constitution delegating to the Congress power to regulate interstate commerce and to confine the power of the States within much narrower limits than those over which many of them have sought to exercise it. A recent decision by United States Circuit Judge Sanborn of the United States Circuit Court for the District of Minnesota, goes so far in this direction that if it shall be sustained by the United States Supreme Court and carried to its logical conclusion, it would seem to restrict the opportunities of

the States for oppressive regulation. The Legislature of the State of Minnesota had enacted statutes reducing passenger fares within that State about 33⅓ per cent and reducing freight charges on certain commodities within the State about 7.37 per cent. By orders of the Minnesota Railroad and Warehouse Commission, general merchandise freight charges on shipments wholly within the State were reduced by from 20 to 25 per cent and certain specific charges on freight shipped from distributing points just within the borders of the State to other points in the State were reduced. Suits were brought by shareholders of the railways affected by these legislative acts and orders of the Commission, against the railway companies, the Attorney General of the State, and the Members of the Railroad and Warehouse Commission to prevent them from maintaining the reduced fares and rates on the grounds (1) that the orders of the Commission and the acts of the Legislature described, substantially burdened and regulated interstate commerce on the railroads of these companies, and (2) that their necessary effect was the confiscation of the property of the companies. Judge Sanborn found that "each of those acts and orders is violative of the Fourteenth Amendment of the Constitution and void." He further found that "each of the acts and orders challenged has the natural and necessary effect substantially to burden and directly to regulate interstate commerce, to create undue and unjust discriminations between localities in Minnesota and those in adjoining States, and it is unconstitutional and void." Interest in this decision centers in the finding last quoted above.

In this case the companies for the first time made an effective showing upon the facts as to the effect of State regulations upon interstate commerce and demonstrated that, although the regulations on their face related only to intrastate commerce, the effect of their application would necessarily be to require reductions of interstate charges. Upon this showing Judge Sanborn's decision was founded on the following propositions:

"To the extent necessary completely and effectually to pro-

tect the freedom of and to regulate interstate commerce the nation by its Congress and its courts may affect and regulate intrastate commerce, but no farther.

"To the extent that it does not substantially burden or regulate interstate commerce a State may regulate the intrastate commerce within its borders, but no farther.

"If the plenary power of the nation to protect the freedom of and to regulate interstate commerce and the attempted exercise by a State of its power to regulate intrastate commerce, or the attempted exercise of any of its other powers, impinge or conflict, the former must prevail and the latter must give way, because the Constitution and the acts of Congress passed in pursuance thereof are the supreme law of the land, and 'that which is not supreme must yield to that which is supreme.' "

Charges for interstate transportation and for intrastate transportation on the railways of the United States are so intimately interwoven and are so closely interdependent that, should Judge Sanborn's decision be sustained by the United States Supreme Court, it will substantially deprive the States of the power of fixing transportation charges. It would seem also that, if carried to its logical conclusion, it may prevent the States from enacting so-called "reciprocal demurrage" laws carrying penalties for failure to supply cars so severe as practically to compel the railways, in times of car shortage, to discriminate in favor of intrastate traffic.

On the whole, the danger of control by the States "becoming so oppressive that it will be difficult for the country to avoid being forced into government ownership in the proximate future" is undoubtedly much less than it seemed to be a few years ago when the wave of drastic regulation was sweeping over the State Legislatures and commissions and their acts and orders had not yet been passed upon by the courts.

Of course, as a practical matter, the powers reserved to the States include some which do not in any way conflict with the delegation to Congress of the power to regulate commerce

among the States and which may still be used to an unreasonable degree, or so as to become oppressive.

By way of illustration, it may be mentioned that the commissions in some of the States show a tendency to require unreasonable and extravagant expenditures by the railways in the provision of large and handsome passenger stations at relatively small towns and to make unreasonable requirements as to the maintenance of roadbed and equipment, as to the minimum number of employees to be assigned to the operation of trains, as to the stopping of express trains at unimportant stations. These powers might be exercised to an unreasonable and oppressive extent and it still be difficult to show that the results were confiscatory.

It is possible, also, that the power of taxation may be so exercised by the States as to become in some degree oppressive. However, the exercise of this power must fall short of what the United States courts would find to be confiscatory, and it can not be so exercised as radically to discriminate against railway property without coming in conflict with the provision of the Constitution of the United States guaranteeing the equal protection of the laws. The tendency in the direction of increasing taxation may be illustrated by citing the fact that for the fiscal year ended June 30, 1900, the railways of the United States paid taxes levied under State, county, and municipal authority amounting to $48,332,273, while in 1910 such taxes amounted to $104,144,076. Part of this increase is to be accounted for by the increased mileage in 1910 as compared with 1900, but the average payments of taxes per mile in 1900 amounted to only $254.78 as compared with $435.65 in 1910, an increase in the ten years of $180.87 per mile or 70.9 per cent.

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(*Continued.*)

14. Summary of Revenues and Expenses of Steam Roads in the United States for April, 1911.

15. The Conflict Between Federal and State Regulation of the Railways.

16. Summary of Revenues and Expenses of Steam Roads in the United States for May, 1911.

17. Railway Wage Increases for the year ending June 30, 1911. Retrenchment in the Railway Labor Force in 1911.

18. Capitalization and Dividends of the Railways of Texas, Year Ending June 30, 1909.

BUREAU OF
RAILWAY ECONOMICS

LOGAN G. McPHERSON
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CHIEF STATISTICIAN

Railway Wage Increases for the Year ending June 30, 1911

Retrenchment in the Railway Labor Force in 1911

Bulletin No. 17

WASHINGTON, D. C.

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10. Summary of Revenues and Expenses of Steam Roads in the United States for January, 1911.
11. (Out of Print.)
12. Summary of Revenues and Expenses of Steam Roads in the United States for February, 1911.
13. Summary of Revenues and Expenses of Steam Roads in the United States for March, 1911.

(*Continued on third page of cover.*)

The numbering of the monthly bulletins as a separate series was abandoned with the December, 1910, issue. Since then all bulletins issued by the Bureau have been given a consecutive number only.

Railway Wage Increases for the Year ending June 30, 1911

Retrenchment in the Railway Labor Force in 1911

WASHINGTON, D. C.
AUGUST, 1911

CONTENTS

RAILWAY WAGE INCREASES FOR THE YEAR ENDING JUNE 30, 1911.

In response to a circular letter sent by the Bureau of Railway Economics to a number of railways, asking for an estimate of the increase in their wage bill for the fiscal year 1911 as compared with 1910, replies were received from systems representing an operated railway mileage of 47,500 miles. These systems were the following: Atchison, Baltimore & Ohio, Chicago & Northwestern, Illinois Central, Missouri, Kansas & Texas, Norfolk & Western, Northern Pacific, Pennsylvania, Southern Railway and Union Pacific.

The data thus furnished to the Bureau has been tabulated, and the results are presented herewith. It will be understood that this study is merely preliminary, and its findings are to be taken only as indicating in a general way the trend of railway wages in 1911. Later returns for the fiscal year 1911 when completed, will present the facts more fully and definitely.

In preparing their estimates, the railways included only such increases in total compensation to employees as were due to increased rates of pay, and excluded those due to enlargements in labor force. This was made easy by the fact that, as records on file in the Bureau seem to indicate, on five miles in every six of the operated railway mileage of the United States a smaller force is employed in 1911 than in 1910. While the 1911 figures were sent to the Bureau before the close of the year, and are partially estimated, yet they are considered as approximately correct.

A number of increases which were effective throughout the whole of the fiscal year 1911 took effect for the first time during the year 1910. As a result, the increase of 1911 over 1910 does not appear so striking as would the increase of 1911 over 1909 or 1908. Furthermore, a number of the increases

which were in effect June 30, 1911, took effect during the fiscal year 1911, and will not make their full force felt until the fiscal year 1912. Hence the increase of 1911 over 1910 does not appear so marked as will that of 1912 over 1910. Therefore the showing in the following tabulations of wage increases for 1911 can be regarded as well within the facts.

The wages paid in 1910 by the ten systems named above, on the 47,500 miles operated by them, amounted to $300,527,000. The estimated wage bill of the same systems for 1911, computed for the same force of employees as in 1910, is $315,163,000. The difference, $14,636,000, represents an increase of 4.87 per cent.

A number of the responding railways arranged the wage increases on their lines according to groups or classes, and these classifications have been tabulated below. The first table (page 7) shows the increases distributed according to operating expense accounts, so far as the increases are reported in this manner. There are given in this table the mileage for which the particular facts were reported, the total compensation in 1910 and 1911 corresponding to that mileage, and the amount and percent of increase.

The second table (page 8) shows the increases in the different classes of employees, so far as they are reported in this manner. Here again there are given the mileage, the total compensation in 1910 and 1911 corresponding to the given class and mileage, and the amount and percent of increase.

AMOUNT AND PERCENT OF INCREASE IN COMPENSATION, 1911 OVER 1910, DISTRIBUTED BY OPERATING EXPENSE ACCOUNTS.

Account	Miles represented	Compensation 1910	Compensation 1911	Increase	
				Amount	Percent
Maintenance of Way and Structures	14,015	$19,364,940	$20,123,924	$758,984	3.92
Maintenance of Equipment	12,064	11,837,707	12,541,368	703,661	5.94
Traffic Expenses	7,629	507,921	523,041	15,120	2.98
Transportation Expenses	7,629	19,702,368	20,541,093	838,725	4.26
General Expenses	9,581	1,394,524	1,447,918	53,394	3.83

As stated in the text, only such increases in total compensation are included in this table as are due to increased rates of pay, those due to enlargements in labor force being excluded.

AMOUNT AND PERCENT OF INCREASE IN COMPENSATION, 1911 OVER 1910, DISTRIBUTED BY OCCUPATION CLASSES.

Class	Miles represented	Compensation 1910	Compensation 1911	Increase	
				Amount	Percent
Enginemen	42,089	$21,448,106	$22,671,109	$1,223,003	5.7
Firemen	35,606	11,584,471	12,330,564	746,093	6.4
Conductors	42,089	13,274,634	14,253,712	979,078	7.4
Other trainmen	42,089	25,969,544	27,693,075	1,723,531	6.6
Station agents	19,741	2,275,320	2,358,061	82,741	3.6
Other stationmen	10,739	4,335,794	4,462,011	126,217	2.9
Machinists	23,152	4,442,630	4,710,129	267,499	6.0
Carpenters	9,913	3,354,726	3,534,030	179,304	5.3
Other shopmen	23,152	12,503,799	13,191,048	687,249	5.5
Section foremen	19,741	2,358,239	2,440,082	81,843	3.5
Other trackmen	27,201	15,871,299	16,186,443	315,144	2.0
Telegraph operators and dispatchers	29,605	8,051,637	8,444,387	392,750	4.9

As stated in the text, only such increases in total compensation are included in this table as are due to increased rates of pay, those due to enlargements in labor force being excluded.

Grouping together the first four classes in the foregoing table as "trainmen," the next two as "station men," the next three as "shopmen," and the next two as "trackmen," we find the percentage of increase in wages between 1910 and 1911 to be as follows:

Group	Percent of Increase
Trainmen	6.46
Station men	3.16
Shopmen	5.58
Trackmen	2.18
Telegraph operators and dispatchers	4.88

As was to be expected, there was a considerable increase in the wages of shopmen, corresponding to the large increase shown under the maintenance of equipment account. Trainmen received increases amounting to over 6 percent. Switch tenders, crossing tenders, and watchmen show wage increases, but the classification of employees as switch tenders and watchmen varies so much from road to road, and even on the same road from year to year, that the figures were too unreliable to be tabulated. Increases for the other classes, however, may be regarded as reliable indications of the tendency of railway wages at the present time.

RETRENCHMENT IN THE RAILWAY LABOR FORCE IN 1911.

This study is the result of an attempt to ascertain what retrenchment in the number of men employed by the railways has been made in 1911 as compared with 1910. As the annual reports of the railways to the Interstate Commerce Commission for the fiscal year 1911 will not be ready for some weeks to come, a number of typical railways were requested, under date of May 8, 1911, to prepare a statement of the number of employees on their pay rolls on April 30, 1910, and on April 30, 1911.

The returns thus far received cover nearly 60 percent of the total operated mileage of the country and are as follows:

	Total operated mileage	Total employees	Employees per 100 miles of line
April 30, 1911	139,755	987,790	707
April 30, 1910*	137,671	1,069,570	777
Increase	2,084	–	–
Decrease	–	81,780	70

It will be perceived that while the operated mileage of the railways covered by the study had increased during the year between April 30, 1910 and April 30, 1911, by 2,000 miles, or 1.5 percent, the men employed in operating the increased

*For about 4,500 miles of line, on which it was stated that no retrenchment had taken place, the number of employees was reported as of June 30, 1910, instead of April 30. However, this should not affect the conclusions, as it is not probable that many changes in labor force occurred in the two months succeeding April 30.

mileage had decreased by nearly 82,000, or 7.6 percent. That is, the number of employees for every 100 miles fell during the year from 777 to 707, or 9.0 percent. For each 100 miles of line, the total number of employees was less by 70 men in 1911 than in 1910. If conclusions may be drawn for the whole country from the reports of nearly 60 percent of the mileage, it would appear that during the year under consideration the labor force of the railways was cut by nearly one-tenth, as a result of effort to reduce expenses and effect economies at every point.

Railways representing 19,706 miles of line reported the following changes for the various operating expense accounts:

	Employees per 100 miles of line.		
Account	1910	1911	Decrease
Maintenance of way.....	301	231	70
Maintenance of equipment.	155	151	4
Traffic	6	6	0
Transportation	262	233	29
General*	32	32	0

*Includes miscellaneous.

It will be seen that the equipment, traffic, and general accounts remained practically stationary, but that considerable decreases occurred in maintenance of way and in conducting transportation. The number of maintenance of way employees decreased 23.3 percent and of transportation employees 11.1 percent. Reductions in maintenance of way force frequently but not necessarily indicate retrenchment. One road reporting retrenchment stated, for example, that its reduction in maintenance of way labor force was due directly to unfavorable weather conditions. But a decrease in employees engaged in transportation can be due to but one of two things, or to both—decreased business or enforced economy.

Only a portion of the railways replying to the inquiries classified the changes in their labor force by occupation. These roads, which operate a total of 8,762 miles, reported changes as follows:

Occupation group.	Employees per 1000 miles of line. 1910	1911	Decrease
General officers	19	19	–
Other officers	48	49	1*
General office clerks	241	245	4*
Station agents	154	150	4
Other station men	455	456	1*
Enginemen	253	248	5
Firemen	263	254	9
Conductors	166	167	1*
Other trainmen	520	496	24
Machinists	255	245	10
Carpenters	216	203	13
Other shopmen	816	779	37
Section foremen	168	169	1*
Other trackmen	1,390	1,226	164
Switch tenders, crossing tenders and watchmen	143	145	2*
Telegraph operators and dispatchers	132	130	2
Floating equipment	3.6	2.3	1.3
All other employees	832	779	53
Total	6,077	5,762	315

*Increase.

This table shows that a majority of the occupation groups remained practically stationary, either changing not at all, or increasing or decreasing to a very slight extent. The largest reductions in force are found among the trackmen, miscellaneous employees, and among the shopmen. By combining the groups the changes will be brought out in bolder relief.

Main group.	Employees per 1000 miles of line. 1910	1911	Decrease
Officers and general clerks	309	313	4*
Station men	610	606	4
Trainmen	1,202	1,165	37
Shopmen	1,287	1,227	60
Trackmen	1,559	1,395	164
Switch tenders, etc	143	145	2*
Telegraph operators and dispatchers	132	130	2
All other employees (including floating equipment)	836	781	55

*Increase.

Trackmen per 1000 miles were reduced 164, or 10.6 percent; miscellaneous employees 55, or 6.6 percent; shopmen 60, or 4.7 percent; and trainmen 37, or 3.1 percent. Maintenance of way, represented by trackmen, is here shown to have suffered the greatest reduction in the number of employees, followed by maintenance of equipment, which is represented by shopmen; while conducting transportation, represented by trainmen, also underwent a decrease. Much the same relationship exists among the reductions in the operating accounts of roads that made only partial returns by occupations. The reductions reported by these roads, which have not been included with the reductions shown in the detailed tabulations just presented, center largely on the engineering department, maintenance of way, enginemen and firemen, and maintenance of equipment.

If the data presented in the foregoing pages is representative, and the Bureau has reason to think that it is, the conclusion seems clear that a considerable retrenchment in number of employees has been effected during the past year on the railways of the United States—not only retrenchment per mile of line, but also a retrenchment in the whole number of employees regardless of increased mileage. Not until the complete returns for 1911 are at hand will it be possible to make any

general or definite statement regarding this retrenchment; but the figures cited above show the reductions to be largely in maintenance of way, transportation, and maintenance of equipment forces. That is, the retrenchment in process by the railways at the present time has not only touched the forces which are always the first to suffer when retrenchment is necessary, but is also beginning to cut into the transportation forces, which are maintained at a full quota until rigid economy is demanded.

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

(*Continued.*)

14. Summary of Revenues and Expenses of Steam Roads in the United States for April, 1911.

15. The Conflict Between Federal and State Regulation of the Railways.

16. Summary of Revenues and Expenses of Steam Roads in the United States for May, 1911.

17. Railway Wage Increases for the year ending June 30, 1911. Retrenchment in the Railway Labor Force in 1911.

BUREAU OF
RAILWAY ECONOMICS

LOGAN G. McPHERSON
DIRECTOR

FRANK HAIGH DIXON
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Capitalization and Dividends of the Railways of Texas Year ending June 30, 1909

Bulletin No. 18

WASHINGTON, D. C.

1911

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

1. Summary of Revenues and Expenses of Steam Roads in the United States for July, 1910. (Monthly Report Series, Bulletin No. 1.)
2. Summary of Revenues and Expenses of Steam Roads in the United States for August, 1910. (Monthly Report Series, Bulletin No. 2.)
3. Summary of Revenues and Expenses of Steam Roads in the United States for September, 1910. (Monthly Report Series, Bulletin No. 3.)
4. A Comparative Statement of Physical Valuation and Capitalization.
5. Preliminary Bulletin for November, 1910—Revenues and Expenses.
6. Railway Traffic Statistics.
7. Summary of Revenues and Expenses of Steam Roads in the United States for October, 1910. (Monthly Report Series, Bulletin No. 4.)
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Capitalization and Dividends of the Railways of Texas Year ending June 30, 1909

WASHINGTON, D. C.
AUGUST, 1911

CAPITALIZATION AND DIVIDENDS OF THE RAILWAYS OF TEXAS.

In this study, prepared by request, it has been the purpose to ascertain the capitalization of the railways of Texas, their dividends, and the proportion of non-dividend-paying stock, and to make a comparison in these respects with the railways of the United States as a whole, and with those of other sections of the United States.

The study is for the fiscal year ending June 30, 1909, the latest year for which requisite statistics are available. The data has been obtained from the annual report of the Railroad Commission of Texas and the statistical report of the Interstate Commerce Commission.

From the table which is printed hereafter with explanatory comment, it will be perceived that the capitalization of the Texas roads per mile is $32,070, or less than half the average for the whole United States, which is $73,829. It is of interest to compare this further with Interstate Commerce Commission Group V, which has the lowest capitalization per mile,* $46,364, and with Group II, which has the highest capitalization per mile, $147,300. It should be noted that these amounts represent the gross capitalization per mile, in which are included duplications due to intercorporate ownership. The net capitalization of the railways of the United States as a whole, that is, the gross capitalization less deductions due to the ownership of the securities of one railway by another, and less deduction of securities covering property other than railway property, is $59,259 per mile. The net capitalization of the railways in each group or in each state is not ascertainable. It has therefore been necessary in this comparison to use the figure

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*In the comparisons of Texas with the various groups, Group IX is omitted from consideration, because the State of Texas comprises the major part of Group IX and largely determines its character.

of gross capitalization. While it is likely that the net capitalization of the railways of Texas, if it were ascertainable, would not show the same relative reduction from the gross as that of the United States as a whole, it is significant that the *gross* capitalization per mile of the Texas lines is 45 per cent less than the *net* capitalization per mile of the railways of the country as a whole.

On the same basis of comparison of gross figures, the table shows that the amount of stock per mile is $9,839 in Texas, $32,450 for the United States as a whole, $15,495 in the lowest group (Group V), and $65,456 in the highest group (Group II). The amount of bonds per mile is $22,231 for Texas, $41,380 for the United States, $30,869 for Group V, and $81,844 for Group II.

The average rate of dividend on railway stock is lower in Texas than elsewhere. The average dividend paid in 1909 on the aggregate of dividend-paying and non-dividend-paying stock was less than three-tenths of one per cent. On the similar aggregate of stock for the entire United States, the dividend rate averaged 4.2 percent. In the lowest group (Group IV) this dividend rate averaged 1.6 percent, and in the highest group (Group VII) 6.8 percent. That is, the average dividend rate on the total railway stock of the United States was more than seventeen times as high as that of Texas; in Group IV it was over six times as high, and in Group VII twenty-eight times as high.

The low dividend rate on Texas stock would lead one to expect that the proportion of railway stock paying no dividends would be higher in Texas than in the country as a whole. This proves to be the fact to an extraordinary degree. The ratio that the stock of non-dividend-paying railways bore to the stock of all railways was 95.8 percent in Texas, in the United States as a whole, 29 percent, in the group with the highest ratio (Group IV) 58.7 percent, and in the group with the lowest ratio (Group I) 6.7 percent. It should be noted that for reasons given later in the discussion of the table, this comparison of the proportion of stock not paying dividends is

based on the *total stock* of dividend paying roads compared with the *total stock* of non-dividend-paying roads, and not on the *issues of stock* paying dividends compared with the *issues of stock* that paid no dividends.

Certain discrepancies exist between the data published by the Texas Railroad Commission and that published by the Interstate Commerce Commission. If the higher figures given by the Interstate Commerce Commission had been used as the basis for the foregoing comparison, instead of the lower figures of the Texas Commission, the amounts entering into the comparison would have been but little changed, and the relation between the status in Texas and that in other parts of the country, not at all. Therefore it has not seemed necessary to present these discrepancies in the summary.

CAPITALIZATION AND DIVIDEND RETURNS OF THE RAILWAYS OF TEXA

YEAR ENDING

(United States and Group figures from Statistical Re
Texas figures from 1909 report of th

GROUP.	MILEAGE OWNED.	STOCK.		BONDS.	
		Amount.	Per Mile.	Amount.	Per Mile.
Texas	13,079.41	$128,686,677	$9,839	$290,768,626*b*	$22,231
United States..	236,868.53	7,686,278,545	32,450	9,801,590,390	41,380
Group I.....	7,950.14	324,754,673	40,849	445,333,910	56,016
" II.....	23,236.94	1,520,991,520	65,456	1,901,806,200	81,844
" III...	24,880.48	997,639,248	40,097	1,310,905,552	52,688
" IV ...	14,880.97	396,395,222	26,638	553,027,315	37,163
" V.....	28,377.26	439,709,547	15,495	875,969,066	30,869
" VI ...	50,190.75	1,398,398,631	27,862	1,594,510,949	31,769
" VII ..	13,638.76	407,959,786	29,912	426,517,621	31,272
" VIII.	32,450.48	883,554,572	27,228	1,297,095,370	39,971
" IX ...	18,162.90	318,121,840	17,515	448,028,456	24,667
" X.....	23,099.85	998,753,506	43,236	948,395,951	41,056

a The figures exclude switching and terminal companies.

b Includes equipment trust obligations amounting to $7,956,426.

c Includes $25,666,134 held in treasury, pledged as collateral secur
as follows:

Group I	$29,749	Group IV	
" II	8,327,444	" V	
" III	9,152,575	" VI	

F THE UNITED STATES AS A WHOLE, AND OF THE SEVERAL GROUPS:
NE 30, 1909.

of the Interstate Commerce Commission for 1909;
exas Railroad Commission).*a*

AL RAILWAY CAPITALIZATION.		DIVIDENDS DECLARED IN 1909.		TOTAL STOCK OF RAILWAYS WHICH PAID NO DIVIDENDS IN 1909	
Amount.	Per Mile.	Amount.	Average Rate Based on Total Railway Stock of Group.	Amount.	Percent of Total Stock of All Railways of Group.
9,455,303*b*	$32,070	$307,850	0.24	$123,337,265	95.8
37,868,935	73,829	321,071,626	4.2	2,227,650,417*c*	29.0
70,088,583	96,865	19,575,320	6.0	21,739,094	6.7
22,797,720	147,300	71,484,423	4.7	420,996,237	27.7
08,544,800	92,785	35,153,385	3.5	368,252,631	36.9
49,422,537	63,801	6,471,801	1.6	232,639,792	58.7
15,678,613	46,364	9,251,150	2.1	253,874,556	57.7
92,909,580	59,631	67,187,584	4.8	241,928,577	17.3
34,477,407	61,184	27,793,005	6.8	28,166,800	6.9
30,649,942	67,199	25,029,670	2.8	232,382,171	26.3
56,150,296	42,182	4,681,471	1.5	211,028,138	66.3
47,149,457	84,293	54,443,817	5.5	216,642,421	21.7

ield in sinking and other funds, etc. Amounts assigned to groups are

948,900	Group VII	$1,500
744,720	" VIII	2,486,386
603,285	" IX	155,675
	" X	2,215,900

The amount given in the table as representing the stock of all American railways on which no dividend was declared in 1909 is $2,227,650,417, or 29 percent of the total stock outstanding. This amount is ascertained by adding together the total outstanding stocks of all railways that declared no dividends in 1909. The corresponding item in the Interstate Commerce Commission's statistical report for 1909, page 57, is $2,766,104,427, and the corresponding percentage 35.99 percent. The discrepancy between these two sets of figures is due to the fact that the Interstate Commerce Commission added together all *issues* of stock on which no dividends were paid, instead of the total stocks of all railways declaring no dividends. Thus the Interstate Commerce Commission's total includes a considerable amount of common stock of railways that paid a dividend on their preferred, but not on their common issues. It has proved impossible to secure from the Interstate Commerce Commission or from its reports a statement of non-dividend-paying stocks in each group corresponding to the amount reported by the Commission for the United States, which has made it necessary to make up the item in the way described. For comparative purposes this data is as valuable as that of the Interstate Commerce Commission, for it gives information of the capitalization of railways paying no dividends whatever on their capital stock.

Switching and terminal companies have not been included in the statistical reports of the Interstate Commerce Commission since 1907. In order to make the statistics comparable, these companies have been omitted from the Texas figures.

Certain differences exist between the returns of the Interstate Commerce Commission when computed for the state of Texas and those of the Texas Railroad Commission. These differences fall into three main groups—differences due to variations in classification, differences arising out of the failure of roads to file reports, and differences in methods used in apportioning capital to those portions of interstate railways that lie within the state of Texas. Among the differences due to varying classification may be mentioned the inclusion of

notes, debentures, pledged bonds, and miscellaneous obligations with funded debt, and the inclusion of branches and spurs with miles of line. For all the roads failing to file operating statements with the Interstate Commerce Commission, mileage figures are reported by that Commission, but nothing more. Differences due to methods of capital assignment are as follows. Where a railway lies in more than one group, the Interstate Commerce Commission usually apportions the capitalization of such road among the several groups in the proportion of the mileage lying within the respective groups. The Texas Railroad Commission, however, apportions the capitalization of each railway entering or passing through the state on its own merits; that is, on the basis of what it considers to be the proper valuation of that part of the railway lying in Texas. As the tendency of the Texas Commission is always toward a low valuation, it is not strange that it assigns a lower capitalization to the Texas portion of the interstate railways than does the Interstate Commerce Commission.

This study, the method of which was determined in the request for its preparation, was based, as already shown, upon the Texas Railroad Commission's figures. Yet the discrepancies between the Texas Commission figures and the Interstate Commerce Commission figures, the reasons for which have already been explained, are not sufficient to vitiate in any respect the conclusions of this study. It does not therefore seem worth while to present in detailed tables the statistical variations in the two reports.

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

(Continued.)

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17. Railway Wage Increases for the year ending June 30, 1911. Retrenchment in the Railway Labor Force in 1911.

18. Capitalization and Dividends of the Railways of Texas, Year Ending June 30, 1909.

BUREAU OF
RAILWAY ECONOMICS

LOGAN G. McPHERSON
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The Cost of Transportation on the Erie Canal and by Rail

Bulletin No. 21

WASHINGTON, D. C.

1911

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

1. Summary of Revenues and Expenses of Steam Roads in the United States for July, 1910. (Monthly Report Series, Bulletin No. 1.)
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9. Summary of Revenues and Expenses of Steam Roads in the United States for December, 1910. (Monthly Report Series, Bulletin No. 6.)
10. Summary of Revenues and Expenses of Steam Roads in the United States for January, 1911.
11. Comment on the Decision in the Western Advanced Rate Case No. 3500. (Out of Print.)
12. Summary of Revenues and Expenses of Steam Roads in the United States for February, 1911.
13. Summary of Revenues and Expenses of Steam Roads in the United States for March, 1911.

(*Continued on third page of cover.*)

The numbering of the monthly bulletins as a separate series was abandoned with the December, 1910, issue. Since then all bulletins issued by the Bureau have been given a consecutive number only.

The Cost of Transportation on the Erie Canal and by Rail

WASHINGTON, D. C.
OCTOBER, 1911

THE SOURCES OF INFORMATION utilized in the preparation of this study are the following:

Annual reports of the New York State Superintendent of Public Works.

Annual reports of the New York State Comptroller.

Annual reports of the New York State Engineer.

Report of the Committee on Canals of New York State (Greene Committee), 1899.

Reports of the Inland Waterways Commission, the United States Census Bureau, Bureau of Corporations, and Interstate Commerce Commission.

A. Barton Hepburn--Artificial Waterways and Commercial Development, (New York, 1909).

Publications of the Buffalo Historical Society.

Articles by Secretary John A. Fairlie of the Greene Committee.

Personal interviews with the statistician to the New York State Superintendent of Public Works, assistants in the offices of the New York State Comptroller and State Engineer, and others.

SUMMARY.

A comparison of the cost of transportation by canal and by rail should include not only the immediate cost of conveyance, but also the cost of capital, of operation, and of maintenance.

Since 1882 the canals of the state of New York have been maintained and operated at the expense of the state for the free passage of boats, the only charges paid by the shipper by canal being those of the boatmen for conveyance. This does not mean that the fixed charges and cost of maintenance are obliterated but that they are borne by the community as a whole instead of by the shipper.

Official data indicates that up to 1905 the cost of the Erie Canal was about $57,600,000 or $163,600 per mile.

If only four per cent be allowed for interest charges and extraordinary repairs and depreciation on the Erie Canal, and its total cost be taken at only $55,000,000, the annual fixed charge for these purposes is $2,200,000. This may be termed the aggregate cost of capital reduced to an annual basis.

As nearly as can be computed from ascertainable data the expense of maintaining the Erie Canal borne by the state of New York for the year 1909 was $672,105.

As nearly as can be computed from ascertainable data the average ton-mile charge made by the boatmen for conveyance of traffic over the Erie Canal is 2 mills.

A liberal estimate of the traffic on the Erie Canal for the year 1909 is 435,000,000 ton miles.

Apportionment of the aggregate annual cost of capital to this ton mileage gives 5.06 mills per ton mile. The cost of maintenance likewise apportioned gives 1.55 mills per ton mile. These items added to the immediate charge for conveyance of 2 mills make the total cost of transportation of freight on the Erie Canal 8.61 mills per ton mile.

For the same year of 1909 the average freight receipts were 6.2 mills per ton mile by the New York Central, 6.1 mills by the Erie, 7.4 mills by the Lackawanna, and 6.4 mills by the Lehigh Valley.

Whichever one of these various railway average receipts per ton

mile be taken, the cost of transportation on the Erie Canal exceeds it by from sixteen to more than forty per cent.

These average rail receipts moreover include returns from high-grade merchandise such as is not carried in any quantity on the Erie Canal. The traffic of the Erie Canal is composed principally of grain, lumber, iron and iron ore, stone, and coal. The receipts of the railways from such traffic are lower than their average receipts, and therefore the ratio of rail receipts to canal receipts on the kind of traffic that is carried by canal is lower than the above percentages indicate.

The railways moreover are in service all of the time while the canal is idle an average of four and one-half months of each year.

It is impossible at this time to compute or even estimate what the total cost of transportation will be on the new barge canal into which the Erie Canal is being transformed. The Greene Committee of 1899 estimated the cost of the barge canal at about $60,000,000. Already more than $100,000,000 have been appropriated for the purpose, and it seems probable that another $19,000,000 will be required for terminals.

The Cost of Transportation on the Erie Canal and by Rail.

In the wide discussion regarding canals and inland waterways in this country during the past few years, little attention has been directed to the total cost of canal transportation. The term "total cost" is here used to cover not only the immediate cost of conveying goods, but also the cost of maintenance of the canal, cost of ordinary repairs, and fixed charges, dividends, and depreciation charges, if any.

Freight rates via the Erie Canal are frequently contrasted with freight rates via railway, but as they comprise only the immediate transportation cost, that is, the direct charge for conveyance alone, they are hardly comparable with railway rates, which provide the revenue from which must be met not only the cost of conveyance, but also fixed charges upon the capital invested in the plant and the expense of maintenance of plant and equipment. All tolls on New York State canals were abolished in 1882, and the canals since that date have been maintained and operated at the expense of the state for the free passage of boats. Thus the only charges made against a shipper of goods by canal are those of the boatman who handles the goods, and these charges do not help to pay for the maintenance of the canal or for repairs. From the shipper's point of view a canal rate of two mills a ton mile is unquestionably preferable to a railway rate of six mills, if speed and convenience of handling are not as important to him as a low rate. It will be shown, however, that from the broader point of view of the community the railway rate, although apparently higher, may not actually be so. The maintenance and fixed charges on the canal, which are borne by the community, may amount to more than the difference of four mills per ton mile, which is the immediate saving to the shipper. This raises the question whether the burdening of the entire community for the benefit of the shippers, who constitute only a portion of it, is justified. But leaving this question aside, a fair comparison of the cost of transportation by canal and by rail should certainly be of aggregates that include every element in those respective costs.

This study is an effort to estimate the total cost of transporting a ton of freight one mile on the Erie Canal at the present time, and to compare that cost with typical or average railway ton-mile freight

receipts. To reach an estimate of transportation cost on the Erie Canal, it has been necessary to ascertain three items in that cost: first, fixed charges on the canal, or cost of capital; second, cost of maintenance; third, immediate cost of transportation. The sum of these three items will give, fourth, the total cost of transportation.

The Erie Canal is a product of state enterprise, paid for from funds obtained for the most part through loans made by the State of New York. These loans have to a large extent been repaid, partly out of the revenue from the canal, and partly from sinking funds established and built up through taxation. Because of this liquidation of the canal debt, interest charges paid by the state on behalf of the canal have till recently been comparatively small. The canal represents, however, the investment of the people of the State of New York in a transportation plant, just as a railway represents an investment on the part of its stockholders and bondholders. In ascertaining canal transportation costs that shall be strictly comparable with railway transportation costs, it will therefore be necessary to arrive by some method at the physical value of the Erie Canal today and on that value compute fixed charges, representing interest on the investment and depreciation.

But how estimate the value of the canal? There are two ways: first, to take the total cost of construction and permanent improvements to date or, second, to make a physical valuation of the whole canal property. Clearly, it is impossible to value the property without a careful appraisal. The statement so frequently made during the New York State canal campaign of 1903 that the Erie Canal, as it stood, was worth more than the total amount expended on it since its inception, cannot be accepted without proof, especially as value depends so definitely on performance. The canal is not of value except as a canal, and as a canal is valuable only in proportion to the service rendered by it. It is feasible, however, to ascertain the total cost of construction and improvement of the Erie Canal as a measure of its present value.

Complete official data showing the cost of the Erie Canal to 1905, the year when work on the new barge canal was commenced, are not available. The canal auditor of the State of New York, in his annual report for 1882, stated the total cost to that year as $49,592,000. From 1882 to 1905 a number of special appropriations were made by the New York legislature for the purpose of improving the state

canals, chiefly by deepening the channels and lengthening the locks. Among these appropriations was one of $9,000,000, made in 1895 for the purpose of increasing the lock capacity and depth of the Erie, Champlain and Oswego canals. Of the amounts spent under the latter appropriation up to July 15, 1898, more than five-sixths, or $6,787,000, was expended on the Erie Canal.* What proportion of the other appropriations was applied to the Erie Canal it is not possible to ascertain, but the share of that canal in the total was considerably over one-half. The Greene Committee estimated that the cost of constructing and improving the Erie Canal down to 1896 had amounted to $56,165,000.† It is probable, therefore, that Hepburn's estimate of $57,600,000‡ as the total cost to 1905 is well under the truth. On the basis of $57,600,000, the cost of the Erie Canal up to 1905 was $163,600 a mile, which may be compared with the cost of road per mile of the four main trunk lines between Buffalo and New York—New York Central, Erie, Lackawanna, and Lehigh Valley. The cost of road per mile of these railways, according to the reports made to the Interstate Commerce Commission for 1905, was as follows:

New York Central	$181,250
Erie	292,970
Lackawanna	90,240
Lehigh Valley	60,490
Average	$212,716

Canal construction is far more expensive than is ordinarily appreciated, as is seen from the foregoing comparison.

It will now be possible to estimate the total cost of transportation on the Erie Canal, made up of the three items already enumerated: cost of capital, cost of maintenance, and immediate cost of transportation.

First. *Cost of Capital:* Taking four per cent as the rate of upkeep on the Erie Canal—an item intended to provide for interest charges and for extraordinary repairs and depreciation—and using a con-

* Report of Committee on Canals of New York State, 1899, p. 162. This committee is commonly known as the Greene Committee.

†Report, p. 153.

‡A. Barton Hepburn: Artificial Waterways and Commercial Development, p. 100.

servative estimated value of but $55,000,000 for the canal at the present time, instead of the $57,600,000 cited above, we have a total annual fixed charge of $2,200,000. This amount will be apportioned per ton mile of canal traffic in 1909 in a later paragraph.

Second. *Cost of Maintenance:* The cost to the state of New York of maintaining the Erie Canal in 1909, according to data contained in the annual report of the Superintendent of Public Works of that state,* amounted to $672,105. This amount is ascertained by adding to the $500,551 of operating expenditures and ordinary repairs a proportion, obtained by pro-rating on the basis of comparative expense, of the total general and division expenses of the canals of the state. This added charge covers administrative and supervisory expenses. The reduction of this item of maintenance to a ton-mile basis will be made shortly.

Third. *Immediate Cost of Transportation:* This is composed of the boatmen's charges for conveyance. Canal boat rates vary considerably with the season, the condition of traffic, and the attitude of the boatmen. There are so few owners of boats on the Erie Canal at present that they can regulate boat rates practically at will. The actual cost incurred by the boatmen in conveying wheat on the Erie Canal was estimated by the Greene Committee of 1899† at 1.75 mills per ton mile. This estimate covers interest at five per cent on investment in boats, all expenses for wages of boathands, and repairs, deterioration and insurance on boats, without allowance, however, for profit to the boatmen. The average rate on wheat from Buffalo to New York during the season of 1909 varied from 2.07 mills per ton mile‡ in July to 3.33 mills in October and November; and on corn from 1.87 mills to 3.07 mills. The average for the season was 2.60 mills per ton mile on wheat and 2.35 mills on corn. These rates differ by less than one-half of one per cent from the average of the rates reported by the Superintendent of Public Works for the years 1900 to 1909, and may therefore be considered as representative. The foregoing rates and estimates apply to grain only. For all commodities moved on the canals of New York State, the average ton-mile rate between 1903 and 1907 was 2.00 mills.§ An

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*Report for 1909, pp. 31-39.
†Report of Committee on Canals of New York State, 1899, p. 57.
‡Ascertained by reducing the through rate per bushel to a ton-mile basis.
§Hepburn, p. 104.

estimate of 2.00 mills for the average ton-mile rate on the Erie Canal today would therefore seem to be a reasonable one. This represents the immediate charge for conveyance.

Fourth. *Total Cost of Transportation:* Of the three components of transportation cost so far discussed, two have been gross amounts for the Erie Canal as a whole, while only the last is expressed in terms of ton-mile traffic. To reach a figure of total cost per ton per mile it will be necessary to ascertain the total ton mileage of the traffic on the Erie Canal in 1909, and reduce the first two amounts to a ton-mile basis.

Unfortunately, no ton-mileage figures are reported for the canal traffic in New York State at the present time. It will be necessary to make an estimate for the Erie Canal based upon the reports of tonnage carried. The total number of tons of freight carried on the Erie Canal in 1909 was 2,031,307. What proportion of this was through freight was not reported, but if the proportion was the same as in 1908, then 436,731 tons consisted of through freight, and 1,594,576 tons of way freight. If we assume that way freight was carried an average of half the length of the canal, or 176 miles—which is a liberal assumption—and that all the through freight was carried the whole length of the canal, or 352 miles, we have a total ton mileage of 435,000,000 for 1909.

On the basis of 435,000,000 ton miles of traffic in 1909, the fixed charges or cost of capital, $2,200,000, were equivalent to 5.06 mills per ton mile; and the cost of maintenance, $672,105, to 1.55 mills per ton mile. The total cost of transporting one ton of freight one mile on the Erie Canal in 1909 was made up, then, of the following items:

Cost of capital	5.06 mills
Cost of maintenance	1.55 "
Immediate cost of transportation	2.00 "
Total	8.61 mills

Thus there is obtained a total charge for canal transportation of 8.61 mills per ton mile, directly comparable with a railway freight rate. What railway freight rate or receipt shall be quoted in comparison with this 8.61 mills of canal cost? By the four principal railways running between Buffalo and New York freight receipts

per ton mile in 1909 were reported to the New York State Public Service Commission as follows:

New York Central	6.2	mills
Erie	6.1	"
Lackawanna	7.4	"
Lehigh Valley	6.4	"

Whichever one of these various railway average receipts per ton mile be taken, the cost of transportation on the Erie Canal will be found to exceed it by from sixteen to more than forty per cent. Even when compared with average railway receipts for the whole United States, the Erie Canal cost of transportation is considerably the higher. Thus average freight receipts per ton mile in 1909, for all the railways of the United States, amounted to 7.63 mills, as compared with 8.61 mills of cost on the Erie Canal. For specific commodities the result is similar. The Interstate Commerce Commission reports that average railway freight receipts in 1909, for four of the commodities which make up a large part of the Erie Canal traffic, were as follows:

Grain	6.11	mills
Lumber	7.70	"
Anthracite coal	6.03	"
Bituminous coal	5.12	"

None of these averages, it will be observed, is as high as the average cost of transportation via the Erie Canal.

All this is true despite the very conservative estimates in making up the figures for the Erie Canal—and this conservatism is worthy of special emphasis. Thus the ton mileage estimate used is probably too large, and the ton-mile canal rates based on that estimate are correspondingly low. In the opinion of the statistician to the New York Superintendent of Public Works, the average length of haul of way freight over the Erie Canal is not over 100 miles, yet the estimate here adopted is 176 miles. Again, four percent is a conservative rate for depreciation and interest. The stock and bonds of all the railways in the United States in 1909 had an average dividend and interest rate alone that exceeded four per cent, and an allowance of four percent for both interest and depreciation charges

in connection with the Erie Canal, is, in comparison, clearly a minimum. Finally, the estimate of value of the Erie Canal property used in the computation is considerably lower than the estimates of the Greene Committee and of other careful students of canal history.

Another fact that must be recognized in a comparison of railway and canal transportation costs is that the grade of goods shipped via canal is far inferior to that shipped via railway. The goods sent by canal are heavier, coarser, of less value, and naturally are carried at a lower average rate. Of the tonnage carried over the New York canals in 1909, for example, nearly a third (31.8%) consisted of stone, rock, lime and clay; another third (36.6%) consisted of coal, iron ore, pig iron, boards, timber, pulp wood and wood pulp; while a fifth (21.2%) was made up of grain, ice and salt. It is clear that an average railway freight rate based only on such articles as were carried by the Erie Canal in 1909 would be lower than the average freight rate on all articles carried by railways. The computations made above, therefore, result in an average canal rate lower than if the grade of articles carried by the canal averaged as high as on the railways. Notwithstanding this, the average canal rate, as has been shown, is actually higher than the highest average railway freight receipt quoted.

One cause of the high cost of transportation on the Erie Canal is the fact that the canal remains idle so large a part of each year. The average length of the canal season is 223 days, or about 7½ months. During the remainder of the year the plant and the boats lie practically idle, although all of the general and many of the maintenance expenses continue without change. In the estimate of the Greene Committee regarding the actual cost of transportation. allowance was made for this period of idleness by computing all expenses on the basis of only seven round trips a year—a full load on the down trip and a third of a full load on the return. But in estimating depreciation and interest charges no such allowance can be made—the plant is in existence and must be maintained, whether in operation or not. Whether or not this long period of idleness each year on the part of the canal is responsible for a large or a small part of the greater cost of canal as compared with railway transportation, it is an inherent feature of canal business in the state of New York and must be taken into account when comparing the canals and railways of that state.

This study has been limited to the Erie Canal of today, all the statistics being based on past performances of record. The people of the state of New York are now engaged in spending more than $100,000,000 in the enlargement and improvement of the canal system of their state. What the total cost of transportation on the new barge canal now emerging from the old Erie will be, no one is in a position to know definitely. The Greene Committee of 1899 estimated the cost of the barge canal at about $60,000,000. Already more than $100,000,000 has been voted for this purpose, with the possibility that another $19,000,000 will be required for terminals. The Greene Committee also made an estimate of the cost to the boatmen of conveying goods through the barge canal, corresponding to their estimate of 1.75 mills on the old Erie referred to in an earlier paragraph. The estimate on the barge canal was 0.52 mill. Whether this estimate will prove to be approximately accurate, or whether time will show it to have been too low, no one at the present time can tell, as no facts exist on which even an approximation may rest. It is clear, however, that having added so greatly to the cost of the canal, rates must be much lower, or volume of traffic far greater, or cost of maintenance and repair lower in proportion to volume of traffic—one or all of these must result before the total cost of transportation on the new Erie will fall to or below the level of the average railway freight rate.

It seems clear, then, from the data presented in the foregoing pages, that the transportation of goods on the Erie Canal at the present time is a more expensive process, considered from the broadest point of view, than on the typical or average American railway, whether or not that railway be one that competes directly with the canal.

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

(*Continued.*)

14. Summary of Revenues and Expenses of Steam Roads in the United States for April, 1911.
15. The Conflict Between Federal and State Regulation of the Railways.
16. Summary of Revenues and Expenses of Steam Roads in the United States for May, 1911.
17. Railway Wage Increases for the year ending June 30, 1911. Retrenchment in the Railway Labor Force in 1911.
18. Capitalization and Dividends of the Railways of Texas Year Ending June 30, 1909.
19. Summary of Revenues and Expenses of Steam Roads in the United States for June, 1911.
20. Summary of Revenues and Expenses of Steam Roads in the United States for July, 1911.
21. The Cost of Transportation on the Erie Canal and by Rail.

BUREAU OF
RAILWAY ECONOMICS

LOGAN G. McPHERSON
DIRECTOR

FRANK HAIGH DIXON
CHIEF STATISTICIAN

Analysis of the Accident Statistics of the Interstate Commerce Commission for the year ending June 30, 1911

BULLETIN No. 23
WASHINGTON, D. C.
1911

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

1. Summary of Revenues and Expenses of Steam Roads in the United States for July, 1910. (Monthly Report Series, Bulletin No. 1.)

2. Summary of Revenues and Expenses of Steam Roads in the United States for August, 1910. (Monthly Report Series, Bulletin No. 2.)

3. Summary of Revenues and Expenses of Steam Roads in the United States for September, 1910. (Monthly Report Series, Bulletin No. 3.)

4. A Comparative Statement of Physical Valuation and Capitalization.

5. Preliminary Bulletin for November, 1910—Revenues and Expenses.

6. Railway Traffic Statistics.

7. Summary of Revenues and Expenses of Steam Roads in the United States for October ,1910. (Monthly Report Series, Bulletin No. 4.)

8. Summary of Revenues and Expenses of Steam Roads in the United States for November, 1910. (Monthly Report Series, Bulletin No. 5.)

9. Summary of Revenues and Expenses of Steam Roads in the United States for December, 1910. (Monthly Report Series, Bulletin No. 6.)

10. Summary of Revenues and Expenses of Steam Roads in the United States for January, 1911.

11. Comment on the Decision in the Western Advanced Rate Case, No. 3500. (Out of Print.)

12. Summary of Revenues and Expenses of Steam Roads in the United States for February, 1911.

13. Summary of Revenues and Expenses of Steam Roads in the United States for March, 1911.

(*Continued.*)

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Analysis of the Accident Statistics of the Interstate Commerce Commission for the year ending June 30, 1911

WASHINGTON, D. C.
NOVEMBER, 1911

ANALYSIS OF THE ACCIDENT STATISTICS OF THE INTERSTATE COMMERCE COMMISSION FOR THE YEAR ENDING JUNE 30, 1911.

In view of the fact that the press report of railway accidents for the year ending June 30, 1911, given out from the offices of the Interstate Commerce Commission did not sufficiently analyze the figures to bring out their significance and avoid the danger of misunderstanding, a further analysis has been made by the Bureau of Railway Economics and is herewith submitted. It is to be regretted that these figures cannot be related to the number of passengers carried or the number of trains, but statistics of traffic for the year ending June 30, 1911, will not be available for several months. Particular attention is called to the fact that the number of passengers on passenger trains killed during the year, for whose deaths the railways were probably responsible, is only 96.

At the end of this bulletin there is inserted the portion of the press notice of the Interstate Commerce Commission referred to that relates to the statistics for the fiscal year 1911.

Total Statistics of Accidents.

	Killed.	Injured.
Total casualties	10,396	150,159
From this total deduct—		

	Killed.	Injured.		
Trespassers	5,284	5,614		
Other persons (not passengers or employees)	1,154	5,073		
			6,438	10,687
Leaving passengers and employees			3,958	139,472
Of which passengers comprise			356	13,433
And employees comprise			3,602	126,039

Accidents to Passengers.

	Killed.	Injured.	Killed.	Injured.
Total casualties			356	13,433
Deduct passengers on freight trains	18	649		
And newsboys, express and mail clerks, Pullman employees, etc.	57	1,391		
			75	2,040
Leaving as passengers proper on passenger trains			281	11,393
Deduct accidents for which railways are not responsible, such as passengers coming in contact with obstructions, getting on and off cars, being run over in yards and on crossings			185	5,737
Number of passenger accidents on passenger trains for which railways were probably responsible			96	5,656

Accidents to Employees.

	Killed.	Injured.	Killed.	Injured.
Total casualties			3,602	126,039
Deduct industrial accidents on bridges, at stations, shops, etc.	439	79,237		
Employees not on duty	292	954		
Falling from or getting on or off cars or engines in cases where railways evidently are not responsible	453	10,799		
Being struck or run over by engine or car in yards, at crossings and elsewhere	1,217	1,911		
			2,401	92,901
Casualties to employees for which railways may have been responsible			1,201	33,138
Total passengers and employees killed for whose deaths railways may have been responsible			1,297	

It should be noted that many of the casualties resulting from derailment, which are included among those for which railways may have been responsible, are due to malicious obstruction of tracks and to negligence of trainmen and signalmen. They are not tabulated here because the report of the Commission does not separate them into those of passengers and employees. The total number of accidents from these causes amounts to 52 deaths and 684 injuries.

It may further be remarked that many of the accidents to employees, such as those resulting from coupling cars, are due to negligence of the employees themselves, but the statistics do not permit of further analysis along this line. It should also be noted that many of the injuries are relatively slight, the only requirement in order to get them into the statistics being that the employee must be incapacitated for work for at least three days in the aggregate during the ten days immediately following the accident. For example, the highest single class of injuries from coupling cars, 907, results in "contusion or laceration of fingers."

From Press Notice issued by the Interstate Commerce Commission concerning railway accidents for the year ending June 30, 1911:

> "This bulletin closes the first year's record of accidents under the law of May 6, 1910. It shows the total number of casualties for the year ending June 30, 1911, to be 160,555 (10,396 killed and 150,159 injured). Of this number, 439 killed and 79,237 injured are classed under the head of "Industrial Accidents," which do not involve the movement of cars or engines on rails. During the year there was a total of 5,287 persons killed and 5,614 injured while trespassing on the property of the railroad, walking on the tracks or stealing rides on trains.
>
> "There is a noticeable decrease in the number of passengers killed during the year as compared with the previous year, being 356 against 421.
>
> "This bulletin gives the total number of employees in the service of the railroad companies on June 30, 1911, as 1,648,033.
>
> "During the year ending June 30, 1911, there was one employee killed to every 458 employed, and one employee injured to every 13 employed."

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

(*Continued.*)

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22. Summary of Revenues and Expenses of Steam Roads in the United States for August, 1911.

23. Analysis of the Accident Statistics of the Interstate Commerce Commission for the Year Ending June 30, 1910.

BUREAU OF RAILWAY ECONOMICS

Established by Railways of the United States
for the Scientific Study of Transportation Problems

LOGAN G. McPHERSON
DIRECTOR

FRANK HAIGH DIXON
CHIEF STATISTICIAN

Comparative Railway Statistics

OF

The United States
The United Kingdom
France and
Germany

Bulletin No. 24

WASHINGTON, D. C.

1911

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

1. Summary of Revenues and Expenses of Steam Roads in the United States for July, 1910. (Monthly Report Series, Bulletin No. 1.)
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(*Continued on third page of cover.*)

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Comparative Railway Statistics

OF

The United States
The United Kingdom
France and
Germany
For 1900 and 1909

WASHINGTON, D. C.
NOVEMBER, 1911.

CONTENTS.

SUMMARY.

For the reasons stated in the introduction the comparisons in this bulletin are in the main between the railways of that portion of the United States designated by the Interstate Commerce Commission as Group II (comprising approximately the States of New York, Pennsylvania, New Jersey, Delaware and Maryland) and those of the United Kingdom; between the railways of Group II and those of France; between the railways of Group II and those of Prussia-Hesse, wherein are the more important railways of Germany. However, if the comparison be extended to include the entire United States, it will set forth the contrast between the supply and utilization of the railway facilities of the country as a whole and the supply and utilization of those of its most densely populated section; and as the comparison of the utilization is on a per mile of line basis it will not be without significance if extended to indicate the contrast between the United States as a whole and the respective countries of Europe.

The more essential information contained in the text and the tables is broadly and roughly summarized in the following paragraphs. As pointed out there can be no exact and absolute comparison.

Group II and the United Kingdom:

The areas of Group II and of the United Kingdom are virtually of the same extent.

The density of population of Group II is but half that of the United Kingdom.

In proportion to area Group II has a greater number of miles of line, but the miles of track are fractionally less.

In proportion to population Group II has over twice as many miles of line, and virtually twice as many miles of track.

The railways of Group II, with number of freight cars per mile of line only about two-thirds of that of the United Kingdom, have a freight train density about three-fourths as great. The freight revenues per mile of line are over one-fourth greater in Group II.

The railways of Group II, with less than one-sixth as many pas-

senger cars per mile of line, have a passenger train density about two-fifths of that of the United Kingdom; the passenger revenues per mile of line are less than half as great.

The fact that passenger mile and ton mile statistics are not recorded for the railways of the United Kingdom prevents a more specific comparison of the utilization of its railways.

The net capitalization per mile of line of the railways of Group II is not available. The capitalization per mile of line of the railways of the United States is less than one-fourth that of the railways of the United Kingdom and less than one-fifth that of the railways of England and Wales alone.

Group II and France:

The area of Group II is but little more than half as large as that of France.

The density of population is virtually the same in Group II and in France.

In proportion to area Group II has one and five-sixths times the miles of line of France and over one and four-fifths times the miles of track.

In proportion to population Group II has twice as many miles of line and almost twice as many miles of track.

The railways of Group II, with freight cars per mile of line one and two-thirds times as many as those of France, have a freight train density over one and one-half times, and a freight density nearly four and one-half times as great. The average tons per freight train are nearly two and three-fourth times, and the average ton miles per inhabitant are over eight times those of France, while the freight revenues per mile of line are over two and one-sixth times as great.

The railways of Group II, with less than one-third of the number of passenger cars per mile of line, have a passenger train density nine-tenths that of France, a little over nine-tenths the number of passengers per train, while the passenger density is not quite three-fourths that of France. The passenger miles per inhabitant are one and one-third times and the passenger revenues per mile of line about one and one-tenth times as great as for France.

The capitalization per mile of line of the railways of the United States is considerably less than half that of the railways of France.

Group II and Prussia-Hesse:

The area of Group II is about four-fifths as large as that of Prussia-Hesse.

The density of population of Group II is about three-fifths of that of Prussia-Hesse.

In proportion to area Group II has one and one-third times the miles of line and nearly one and one-third times the miles of track.

In proportion to population Group II has considerably more than twice as many miles of line and over twice as many miles of track.

The railways of Group II, with number of freight cars per mile of line exceeding that of Prussia-Hesse by about one-fifth, have a freight train density about one-fourteenth greater and a freight density over twice as great. The average tons per freight train are over twice and the average ton miles per inhabitant nearly five times those of Prussia-Hesse, while the freight revenues per mile of line are only about one-sixth greater.

The railways of Group II, with less than one-fourth of the number of passenger cars per mile of line, have a passenger train density about three-fifths that of Prussia-Hesse, a little over two-thirds the average number of passengers per train and a passenger density about two-fifths that of Prussia-Hesse. The passenger miles per inhabitant are only fractionally less, and the passenger revenues per mile of line are about six-sevenths of those of Prussia-Hesse.

The average capitalization per mile of line for the United States is but little more than half that of Prussia-Hesse.

The United States and Group II:

The area of the United States is over twenty-seven times as large as that of Group II.

The density of population of the United States is but one-sixth that of Group II.

In proportion to population the United States has a little more than twice as many miles of line and over one and one-half times as many miles of track. In proportion to area the United States has a fraction over one-third the miles of line of Group II and but little over one-fourth the miles of track.

The railways of the United States, with number of freight cars per mile of line somewhat over one-third of that of Group II, have

a freight train density nearly half as great and a freight density less than two-fifths as great. The average tons per freight train are about three-fourths, the ton miles per inhabitant over four-fifths, while the freight revenues per mile of line are less than one-half those of Group II.

The railways of the United States, with less than two-fifths the number of passenger cars per mile of line, have a passenger train density nearly half as great, nine-tenths the number of passengers per train, and a passenger density little more than two-fifths that of Group II. The passenger miles per inhabitant are about nine-tenths and the passenger revenues per mile of line a fraction less than one-half those of Group II.

This comparison is of the whole United States including Group II, with Group II.

The United States and the United Kingdom:

The area of the United States is twenty-four times as large as that of the United Kingdom.

The density of population in the United States is less than one-twelfth that of the United Kingdom.

In proportion to area the United States has a fraction over two-fifths the miles of line and a fraction over one-fourth the miles of track of the United Kingdom.

In proportion to population the United States has over five times the miles of line and nearly three and one-third times the miles of track.

The railways of the United States, with number of freight cars per mile of line but a fraction over one-fourth of that of the United Kingdom, have a freight train density over one-third as great. The freight revenues per mile of line are over one-half as great.

The railways of the United States, with less than one-sixteenth as many passenger cars per mile of line, have a passenger train density nearly one-fifth that of the United Kingdom, and passenger revenues per mile of line less than one-fourth as great.

The United States and France:

The area of the United States is about fourteen times as large as that of France.

The density of population in the United States is about one sixth that of France.

In proportion to area the United States has about two-thirds as many miles of line and one-half as many miles of track as France.

In proportion to population the United States has over four times as many miles of line and over three times as many miles of track.

The railways of the United States, with number of freight cars per mile of line two-thirds of that of France, with an aggregate freight car capacity eight times as great in proportion to population, have a freight train density three-fourths as great and a freight density one and seven-tenths times as great. The average tons per freight train are over twice, and the ton miles per inhabitant seven times those of France, while the freight revenues per mile of line are virtually the same.

The railways of the United States, with over one-ninth of the number of passenger cars per mile of line, have a passenger train density about two-fifths that of France, about six-sevenths the number of passengers per train and a passenger density somewhat less than one-third that of France. The passenger miles per inhabitant are about one-fourth greater and the passenger revenues per mile of line somewhat over one-half those of France.

The United States and Prussia-Hesse:

The area of the United States is over twenty-one times as large as that of Prussia-Hesse.

The density of population of the United States is a fraction over one-tenth that of Prussia-Hesse.

In proportion to area the United States has about one-half as many miles of line and about one-third as many miles of track.

In proportion to population the United States has nearly five times as many miles of line and over three times as many miles of track.

The railways of the United States, with number of freight cars per mile of line one-half of that of Prussia-Hesse, with an aggregate freight car capacity more than five times as great in proportion to population, have a freight train density over one-half and a freight density over nine-tenths as great. The average tons per freight train are one and one-half times and the average ton miles

per inhabitant four times those of Prussia-Hesse, while the freight revenues per mile of line are only a fraction over half as great.

The railways of the United States, with slightly over one-twelfth of the number of passenger cars per mile of line, have a passenger train density less than one-third that of Prussia-Hesse, less than two-thirds the average number of passengers per train, while the passenger density is a fraction under one-fifth as great. The passenger miles per inhabitant are about eight-ninths and the passenger revenues per mile of line about two-fifths those of Prussia-Hesse.

Among the striking points developed by these comparisons on the per mile of line basis are the different relations sustained by the freight traffic and the passenger traffic of Group II and of the United States to the freight traffic and the passenger traffic of the other countries.

With freight train units one and one-half times those of France, the railways of Group II move four and one-half times the units of freight, but receive freight revenues only two and one-sixth times as great. With freight train units but one-fourteenth greater than those of Prussia-Hesse the railways of Group II move over twice the units of freight, but receive freight revenues only one-sixth greater.

With freight train units three-fourths of those of France the railways of the United States move one and seven-tenths times the units of freight, while the freight revenues per mile are virtually the same. With freight train units a fraction over one-half as great, the railways of the United States move nine-tenths the units of freight of Prussia-Hesse, while the freight revenues are but a fraction over half as great.

With passenger train units nine-tenths those of France, the railways of Group II move only three-fourths the number of passenger units, but receive passenger revenues one and one-tenth times as great. With passenger train units three-fifths of those of Prussia-Hesse, the railways of Group II move about two-fifths the number of passenger units and receive passenger revenues six-sevenths of those of Prussia-Hesse.

With passenger train units about two-fifths those of France, the railways of the United States move somewhat less than one-third of the passenger units and receive passenger revenues somewhat over one-half as great. With passenger train units less than one-third

those of Prussia-Hesse, the railways of the United States move a fraction under one-fifth of the passenger units, while the passenger revenues are about two-fifths those of Prussia-Hesse.

It is repeated that these comparisons are of the average performance per mile of line and have no relation to the aggregate utilization of the railways for any of the countries as a whole.

TEXT

INTRODUCTION.

As the service of the railways of a country is intimately related to the needs of the people of that country, the volume of traffic in large measure is determined at any given time by the aggregate of the population and its character. As the population may be dispersed over an extended region or concentrated in a small area, it is apparent that the extent of the railways and the characteristics of their service are related to the distribution of the population.

The serviceability of railways is to be viewed in the light of both supply and demand.

First, what is the proportion of miles of railway to the population and to the area over which that population is distributed; what are the facilities for moving traffic, the number and power of locomotives, the number and capacity of freight cars and of passenger cars?

Second, what use is made of the railways; what is the number of tons of freight they haul; what is the average number of ton miles handled per mile of line; what are the average ton miles in proportion to the population and in proportion to the area occupied by that population? What is the number of passengers they haul, what is the average number of passenger miles per mile of line, what are the passenger miles in proportion to the population and in proportion to the area occupied by that population?

A light is cast upon the economy of railway operation by the number of tons of freight hauled per freight train, and the number of passengers hauled per passenger train.

The pecuniary relation of the railways to the country they serve is revealed by their capitalization and their revenues.

The financial status of the railways is shown by the relation that their expenses for operation bear to their earnings, and by the relation of their net earnings to their capitalization.

As the population of a country increases its traffic increases, and therefore, other things equal, its railway facilities should increase. A series of comparisons indicating for certain intervals the increase in population, the increase in miles of railway and in facilities, the

increase in freight traffic and in passenger traffic, may indicate roughly the growth in the industry and commerce of a country. The development of the financial status of the railways will also be indicated if this comparison include the changes in capitalization per mile and in revenues and expenses per mile.

In this bulletin an attempt is made to present for the important commercial countries the fundamental statistics which reveal the railway status, and to demonstrate thereby the comparative serviceability, physical efficiency and financial condition of the railways of these countries.

Although their areas are approximately equal, the geographical, racial, and political characteristics of the United States and of Europe are so different that a comparison of the railway facilities and railway service of the total areas would not be enlightening. The less advanced sections of the United States are naturally more prosperous and are making greater progress than the backward regions of Europe. The statistics of the whole United States are not fairly comparable with those of any of the more advanced countries of Europe because of the great difference in area, in diffusion of population, and in general development. That portion of the United States comprised in what the Interstate Commerce Commission designates as Group II, which consists approximately of the States of New York, Pennsylvania, New Jersey, Delaware, and Maryland, is comparable as to area, population, and industrial and commercial development with the United Kingdom, with France, and with Prussia-Hesse, wherein are the more important railways of Germany. Therefore in this bulletin Group II is compared with each of these countries respectively and a comparison is incidentally afforded of each of these countries with the other. The comparison is also made to include the entire United States in order to show the relation, in the respects referred to, of the country as a whole to Group II and to the different foreign countries.

The latest data available for the United Kingdom and for Prussia-Hesse relate to the year 1909. For France there are no more recent returns than for 1908. These are used in the text in comparison with the data of other countries for 1909 in the belief that the results thereby obtained do not vary more than a negligible degree

from those that would be secured were the French statistics for 1909 available. It may be noted, however, that from the detailed tables following the text may be obtained a comparison for the different countries for the year 1908. Because of a change in the practice of the Interstate Commerce Commission the figures throughout the bulletin that apply to the United States as a whole and to Group II are based upon returns which for the years 1900 and 1905 include those of switching and terminal companies, but for the years 1908 and 1909 do not include those of switching and terminal companies.

It must be borne in mind that the industrial and commercial conditions of the United States and of these various countries of Europe widely differ, the channels of traffic are of different character. the volume of traffic is differently constituted and there is difference in the methods of keeping accounts. Therefore there can be no exact and absolute comparison. However, for such items as have been discussed, it is not thought that the variance from exact comparability impairs the essential accuracy of the broad and general deductions. Where close comparisons are impossible, the fact has been stated.

The small tables interspersed in the text immediately following this introduction are epitomized from the more elaborate tables on pages 37 to 47. For a comprehensive statistical comparison the reader is referred to these tables. In connection therewith are many qualifying references that are not indicated in the epitomized tables or the accompanying text.

The statistics which appear in this bulletin were obtained from the annual reports on Statistics of Railways of the Interstate Commerce Commission, the annual compilations of the returns of the railways of the United Kingdom to the Board of Trade, the annual railway reports of the French Minister of Public Works, the voluminous abstracts of official railway returns published from time to time in the Archiv für Eisenbahnwesen, and the annual reports of the Prussian Minister of Public Works. The unit of weight is the short ton of 2,000 pounds. The compilations based upon these statistics were made by the statistical department of the Bureau of Railway Economics.

I.

Railway Mileage in Proportion to Population and to Area.

The expression "density of population" indicates the number of persons living in a given area. The average density of population of any country is ascertained by dividing the total population by the total units of area, for each of which the average density is desired. The following table shows the density of population per square mile:

Population per square mile.	In 1909.	Compared with 1900.
Group II	181.8 persons	increased 21.4 per cent
United Kingdom	370.8 "	increased 9.4 "
France	189.6 "	*decreased* .4 "
Prussia-Hesse	297.0 "	increased 14.8 "
United States	30.4 "	increased 18.9 "

In the succeeding tables and text, "mile of line" and "mile of track" have the significance that is customary in railway parlance. By a "mile of line" is meant the entire roadway for a distance of one mile over which trains are operated. Thus a railway over the ten miles from A to B, whether it be composed of one, two, or any other number of tracks, counts as ten miles of line.

By a "mile of track" is meant one track for the distance of one mile over which trains are operated. Thus if a railway over the ten miles from A to B has four tracks for the entire distance, it would count as forty miles of track.

The number of miles of line in a given region indicates how extensively, and the number of miles of track how intensively, it is supplied with railways.

In the comparisons of "mile of track" only main tracks are used, siding and yard tracks being excluded.

Miles of line.	In 1909.	Compared with 1900.
Group II	23,887	increased 10.0 per cent
United Kingdom	23,280	increased 6.5 "
France	24,931	increased 5.5 "
Prussia-Hesse	23,154	increased 21.2 "
United States	235,402	increased 22.3 "

Miles of track.	In 1909.	Compared with 1900.
Group II	33,558	increased 15.4 per cent
United Kingdom	39,622	increased 10.7 "
France[a]	35,650	increased 5.9 "
Prussia-Hesse	33,133	increased 23.1 "
United States	259,975	increased 25.8 "

a First and second tracks.

Miles of line per 10,000 inhabitants.	In 1909.	Compared with 1900.
Group II	12.18	*decreased 9.4* per cent
United Kingdom	5.17	*decreased 2.6* per cent
France	6.35	increased 4.4 "
Prussia-Hesse	5.67	increased 5.6 "
United States	26.05	increased 2.8 "

Miles of track per 10,000 inhabitants.	In 1909.	Compared with 1900.
Group II	17.11	*decreased 4.9* per cent
United Kingdom	8.80	increased 1.1 "
France	9.08	increased 5.0 "
Prussia-Hesse	8.11	increased 7.3 "
United States	28.77	increased 5.8 "

Miles of line per 100 square miles.	In 1909.	Compared with 1900.
Group II	22.14	increased 10.0 per cent
United Kingdom	19.18	increased 6.5 "
France	12.04	increased 4.1 "
Prussia-Hesse	16.83	increased 21.2 "
United States	7.93	increased 22.3 "

Miles of track per 100 square miles.	In 1909.	Compared with 1900.
Group II	31.11	increased 15.4 per cent
United Kingdom	32.65	increased 10.7 "
France	17.22	increased 4.6 "
Prussia-Hesse	24.08	increased 23.1 "
United States	8.75	increased 25.8 "

Per cent of line having two or more tracks.	In 1909.	Compared with 1900.
Group II	31.2 per cent	27.0 per cent
United Kingdom	55.8 "	55.6 "
France	43.0 "	42.3 "
Prussia-Hesse	42.3 "	40.5 "
United States	8.9 "	6.3 "

That one country has a greater or less number of miles of line or of track than another in proportion to population or to area cannot alone be taken as a criterion of the relative adequacy of the supply of railway facilities. In the aggregate of such facilities, number and power of locomotives and number and capacity of cars are factors of no less importance than miles of track. The demand for transportation, and the efficiency with which railway facilities are utilized in meeting that demand, must also be considered in determining the adequacy of transportation service. It should be noted that while a greater ratio of railway mileage to population or to area ordinarily indicates greater responsiveness to transportation demands, it may not inconceivably signify a redundant and excessive supply of mileage.

II.

Motive Power and Equipment.

While both locomotives and cars are frequently considered to constitute the equipment of a railway there is a growing practice to designate the locomotives as motive power, and the cars as equipment.

Locomotives per 1,000 miles of line.	In 1909.	Compared with 1900.
Group II	561	increased 24.9 per cent
United Kingdom	980	increased 1.0 "
France	480	increased 8.4 "
Prussia-Hesse	838	increased 24.3 "
United States	243	increased 24.6 "

Tractive power, not number of locomotives, furnishes adequate data for comparison of motive power facility. It is obvious that a locomotive that can draw one thousand tons ought not to count the same in a comparison with the locomotive that can draw but five hundred tons. Unfortunately, however, the average tractive power per locomotive or the aggregate tractive power of all locomotives is not ascertainable except for the United States. As the average freight train load of Group II is over twice as great as that of Prussia-Hesse, it is conservative to estimate that the five hundred and sixty-one locomotives per 1,000 miles of line of Group II are capable of greater service than the eight hundred and thirty-eight of Prussia-Hesse, and that the increase of 24.9 per cent in the number of locomotives in Group II, and of 24.6 per cent in the United States as a whole, represents an increase in motive power capacity considerably greater than the increase of 24.3 per cent in the number of locomotives in Prussia-Hesse. The conservatism of this estimate is supported by the respective average capacity of freight cars and average number of tons per freight train, given in following paragraphs.

Cars of all kinds per 1,000 mile of line.	In 1909.	Compared with 1900.
Group II	22,388	increased 17.4 per cent
United Kingdom	36,060	increased .9 "
France	14,704	increased 10.2 "
Prussia-Hesse	19,607	increased 19.1 "
United States	9,423	increased 25.1 "

In Group II, the increase in miles of line for 1909 over 1900 was 10 per cent. The ratio of increase in number of cars was three-fourths greater than the increase in miles of line.

In the United Kingdom the increase in miles of line was 6.5 per cent. The ratio of increase in the number of cars was one-seventh as great.

In France the miles of line increased 5.5 per cent between 1900 and 1908. The ratio of increase in the number of cars was nearly twice as great.

In Prussia-Hesse the increase in miles of line between 1900 and 1909 was 21.2 per cent. The ratio of increase in the number of cars was nine-tenths as great.

In the United States as a whole the miles of line increased 22.3 per cent and the number of cars in a greater ratio by one-tenth.

Passenger and freight cars per 1,000 miles of line in 1909.	Passenger Cars.	Freight Cars.
Group II	375	21,128
United Kingdom	2,270	32,020
France	1,159	*12,811
Prussia-Hesse	1,609	*17,530
United States	136	8,809

The average seating capacity of passenger cars for Group II, for the United Kingdom, for France, and for the United States is not ascertainable. The average for the passenger cars of the Pennsylvania Railroad in 1909 was 63, and for Prussia-Hesse 49. The average seating capacity for Group II is perhaps slightly lower than for the Pennsylvania Railroad, and that for the United States as a whole still lower. It is safe to estimate that the average seating

*Including cars in company's service.

capacity of the passenger cars of the United Kingdom and of France is lower than for the United States.

The average capacity of the freight cars of France in 1908 was 13 tons, of those of Prussia-Hesse in 1909, 15.5 tons, and of those of the United States 35 tons. There are very few, if any, freight cars in England as large as those of the United States, the freight of that country being carried in "waggons" or "trucks" holding from 4 to 8 tons each. The measure of the total freight car capacity of the respective countries is afforded by the following table:

Total number and aggregate capacity of freight cars in 1909.	Total number of freight cars.	Aggregate capacity of freight cars, tons.	Freight car capacity per 10,000 inhabitants.
United States	2,071,338	73,137,546	8,093
United Kingdom	745,348	(Data not available)	
France	*319,788	4,159,565	1,059
Prussia-Hesse	*405,900	6,280,260	1,537

For each inhabitant the United States provides seven and one-half times as much freight car capacity as France, and nearly five and one-half times as much as Prussia-Hesse.

It is true, however, that the canals and rivers are a larger factor in the conveyance of freight in both France and Germany than they are in the United States. Such waterways carry about one-seventh of the total interior freight of Germany and about one-ninth of that of France. Therefore, the aggregate capacity of the interior watercraft should be considered in arriving at the aggregate capacity of the freight vehicles of these countries. The capacity of the inland waterway craft in France in 1907 was 4,234,794 tons which, added to the capacity of the freight cars, gives an aggregate capacity of 8,394,359 tons, or 2,138 tons per 10,000 inhabitants. The capacity of the inland waterway craft of Germany in 1907 was 6,900,000 tons. This added to the freight car capacity of Prussia-Hesse gives an aggregate freight capacity of 13,180,260 tons or 3,226 tons per 10,000 inhabitants. Therefore, it will be perceived that the freight car capacity per inhabitant of the United States is over

*Including cars in company's service.

three and three-fourths times as great as the combined capacity per inhabitant of the freight cars and boats of France, and over two and one-half times as great as the combined capacity per inhabitant of the freight cars and boats of Prussia-Hesse. The aggregate freight car capacity of the United Kingdom is not ascertainable.

The development in power of locomotives and capacity of freight cars in the United States is due to the great volume of long haul traffic.

III.

The Utilization of the Railways.

Up to this point comparisons of the serviceability of railways have been based upon their facilities. Further light is thrown upon that serviceability by the extent to which these facilities are utilized. If railways readily move all of the traffic offered to them the statistics of utilization measure both the extent of the service and the demand for that service. It is widely known that there have been periods in the United States during the past decade when the railways were badly congested, when their facilities were not equal to the immediate demand. However, there is no data to show that all of the traffic offered was not moved sooner or later, and there is no means of ascertaining with approximate accuracy whether such a condition has existed in other countries. Therefore, the following comparisons measure the extent or rather the degree of intensity to which the railways have been utilized, and in the absence of qualifying information may be accepted as a measure of the demand upon them.

The performance of a railway is measured by several units. One of these is

The train mile. This is constituted of the run of one train for the distance of one mile. The total number of miles run by one train counts as the total train miles for that train. The aggregate of the train miles of all trains for a given period constitutes the total number of train miles for that period. If on a railway fifty miles long, ten trains were run each day for the entire length there would be five hundred train miles a day, or for the three hundred working days of the year a total of one hundred and fifty thousand train miles. If on a railway one hundred miles long five trains were run each day for the entire length, there would be five hundred train miles a day, or for the three hundred working days of the year a total of one hundred and fifty thousand train miles. As the aggregate train miles in these two illustrations are the same for the railway fifty miles long and for the railway one hundred miles long, it is obvious that the intensity of train performance cannot be gauged simply by train miles. If the total train miles be divided by the number of miles of line, the quotient indicates the average number

of train miles run over each mile of road. In the case of the fifty-mile road the train miles per mile of line would be three thousand; in the case of the road one hundred miles long the train miles per mile of line would be fifteen hundred. An equivalent expression for train miles per mile of line is train density.

Every railway carries more or less freight for its own use and therefore without pay, and in some countries both freight and passengers are occasionally carried free on governmental or other account. As such gratuitous service does not increase the monetary receipts, it is ordinarily omitted from such statements as appear in this bulletin. Therefore, the term "revenue train miles per mile of line" indicates the train density of trains that have added to the earnings.

The following tables show the density for all trains and for freight trains and passenger trains separately:

Revenue train miles per mile of line.	**In 1909.**	**Compared with 1900.**
Group II	9,715	(Data not available)
United Kingdom	18,009	*decreased 2.1* per cent
France	9,317	increased 2.2 "
Prussia-Hesse	12,164	increased 19.7 "
United States	4,726	increased 2.6 "

Freight train miles per mile of line.	**In 1909.**	**Compared with 1900.**
Group II	4,930	*decreased 5.3* per cent
United Kingdom	6,607	*decreased 19.8* "
France	3,203	*decreased 3.8* "
Prussia-Hesse	4,594	increased 2.7 "
United States	2,417	*decreased 5.5* "

Passenger train miles per mile of line.	**In 1909.**	**Compared with 1900.**
Group II	4,642	increased 11.2 per cent
United Kingdom	11,332	increased 12.6 "
France	5,129	increased 6.9 "
Prussia-Hesse	7,570	increased 64.5 "
United States	2,150	increased 14.3 "

No difference how long a train may be or how many passengers or tons of freight it may carry, it counts a train mile for every mile it runs. Therefore, a decrease in the number of train miles does not necessarily indicate a decrease in traffic. It may indicate that a greater quantity of traffic is being carried per train, and therefore that the performance from the standpoint of the railway is more economical. Of late years the railways in many countries have given especial attention to attaining heavier loads per train.

Therefore from the viewpoint of economical operation, the serviceability of a railway or of the railways of a country is to be judged by the Revenue Train Miles per Mile of Line taken in connection with certain other units. One of these is

Ton Miles per Mile of Line. This expression is analogous to train miles per mile of line. Each ton carried one mile counts as a ton mile. The total number of ton miles carried for a year constitutes the aggregate ton mileage for that year. This aggregate ton mileage divided by the miles of line gives the ton miles per mile of line, or the density of freight traffic.

Ton miles per mile of line.	**In 1909.**	**Compared with 1900.**
Group II	2,451,841	increased 29.0 per cent
France	565,158	increased 18.0 "
Prussia-Hesse	1,069,743	increased 20.3 "
United States	953,986	increased 29.7 "

In Group II the density of freight traffic was nearly four and one-half times as great as in France, and over twice as great as in Prussia-Hesse. The fact that in Group II the increase of 29 per cent in the density of freight traffic was accompanied by a decrease of 5.3 per cent in the number of freight train miles per mile of line, and that the increase in freight density in France of 18 per cent was accompanied by a decrease of 3.8 per cent in freight train miles per mile of line indicates a greater intensive use of motive power and equipment in each of these countries, that is, other things equal, a greater economy in operation.

Another measure of this intensive utilization of motive power and equipment is shown by the

Average tons per freight train.	In 1909.	Compared with 1900.
Group II	479	increased 34.9 per cent
France	177	increased 22.9 "
Prussia-Hesse	233	increased 42.9 "
United States	363	increased 34.0 "

The success of the efforts to economize in operation through heavier loading is indicated by the great increase in the average train load secured in each country. It is significant that this average train load in Group II is nearly two and three-fourths times as great as in France and over twice as great as in Prussia-Hesse. The more powerful locomotives and larger freight cars of the United States are a great factor in this efficiency.

It will be perceived that in each country which shows a decrease in the freight train miles per mile of line the decrease has been accompanied by an increase in the average tons per freight train and the average ton miles per mile of line; that is, in each of these countries a greater freight traffic has been moved with fewer freight trains.

An index to the volume of commerce in proportion to population is afforded by the

Average ton miles per inhabitant.	In 1909.	Compared with 1900.
Group II	2,950	increased 15.5 per cent
France	359	increased 22.9 "
Prussia-Hesse	606	increased 24.7 "
United States	2,421	increased 30.0 "

For each inhabitant of Group II over eight times as many tons of freight are moved by rail as for each inhabitant of France and nearly five times as many as for each inhabitant of Prussia-Hesse.

The railways of the United States as a whole carry for each inhabitant nearly seven times as many ton miles as are carried for each inhabitant of France by its railways, and four times as many as are carried for each inhabitant of Prussia-Hesse. This is all the more remarkable when it is reflected that the density of population in the United States is less than one-sixth of that in France and only about one-tenth of that in Prussia-Hesse.

A comparison of the passenger traffic may be made in the same

manner as that of the freight, that is, with the use of analogous units.

Passenger miles per mile of line.	In 1909.	Compared with 1900.
Group II	290,023	increased 42.9 per cent
France	398,984	increased 8.1 "
Prussia-Hesse	675,023	(Data not available)
United States	127,299	increased 52.8 per cent

It will be perceived that in Group II and in the United States as a whole the increase in the passenger miles per mile of line was greater than the increase in the passenger train miles per mile of line. In France the increase in passenger density was slightly greater than the increase in passenger train density.

An explanation of the lower density of passenger traffic in Group II than in France or Prussia-Hesse is found in the fact that in proportion to population Group II has twice as many miles of line as France, and considerably more than twice as many miles of line as Prussia-Hesse. The significance of this is made manifest by a comparison of the

Passenger miles per inhabitant.	In 1909.	Compared with 1900.
Group II	347.5	increased 27.4 per cent
France	253.7	increased 13.0 "
Prussia-Hesse	366.7	increased 49.8 "
United States	322.1	increased 52.7 "

The ratio is greater for Group II and for the United States than for France, and is only fractionally less for Group II than for Prussia-Hesse. In consideration of the greater ratio of passenger miles per inhabitant in Prussia-Hesse, there must not be overlooked the fact that the component parts of the great army of Germany are in frequent movement from one garrison to another and to and from the often recurring reviews and maneuvers. Moreover, the passenger traffic of the countries of Europe is constituted in no small measure by tourists from other countries, particularly from the United States, the passenger miles of this tourist traffic swelling the aggregate which is credited to the inhabitants of the respective countries.

That the number of passengers carried per train increases more rapidly in the United States than in either France or Prussia-Hesse is shown by a tabulation of the

Average Passengers per train.	In 1909.	Compared with 1900.
Group II	60	increased 27.7 per cent
France	65	increased 1.6 "
Prussia-Hesse	85	increased 6.3 "
United States	54	increased 31.7 "

The inability to take account of the ton mile and the passenger mile traffic of the United Kingdom is regretted. Such statistics are not compiled by any of the railways of Great Britain except that the North Eastern Railway of England compiles freight statistics.

IV.

Capitalization, Revenues and Expenses.

The capitalization of the railways of the United States is the net capitalization per mile reported by the Interstate Commerce Commission. In arriving at this amount, the stocks and securities of one railway corporation that are held by another are excluded because the stocks and securities so held are ordinarily covered by the capital issues of the holding company. This net capitalization is not ascertainable for Group II. There is probably little or no such duplication in the capital issues of the railways of foreign countries.

Capitalization per mile of line.	In 1909.	Compared with 1900.
United States	$59,259	(Data not available)
United Kingdom	274,766	increased 4.9 per cent
France	141,301	increased 5.8 "
Prussia-Hesse	110,727	increased 12.9 "

It is noteworthy that the capitalization per mile of the railways of the United States is but little more than half that of the railways of Prussia-Hesse, considerably less than half that of the railways of France, and less than one-fourth that of the railways of the United Kingdom. The capitalization of the railways of England and Wales alone for 1909 was $328,761 per mile, over five times as great as that of the United States. In view of these figures it becomes clear, as stated by General Henry S. Haines, that the burden of proof that the railway system of the United States is not overcapitalized does not rest upon the railway corporations.

Operating revenues per mile of line.	In 1909.	Compared with 1900.
Group II	$22,021	increased 33.3 per cent
United Kingdom	23,135	increased 5.1 "
France	13,406	increased 8.4 "
Prussia-Hesse	21,056	increased 20.7 "
United States	10,356	increased 34.1 "

These operating revenues for the different countries are not exactly comparable because they are not in all respects similarly con-

stituted. In Prussia-Hesse, for example, certain receipts are included in revenues from operation that in the United States would be classified as "other income." These amount, however, to less than three per cent of the total. However, the relative significance of these revenues cannot be fully appreciated without taking into account the volume of traffic. This factor is included in the comment upon the immediately succeeding tables.

Freight revenue per mile of line.	In 1909.	Compared with 1900.
Group II	$15,693	increased 32.4 per cent
United Kingdom	12,433	increased 4.4 "
France	7,196	increased 8.2 "
Prussia-Hesse	13,580	increased 17.1 "
United States	7,184	increased 31.4 "

For Group II the freight revenues per mile of line are about 25 per cent greater than for the United Kingdom.

For Group II the freight revenues per mile of line are over twice as great as for France. However, as already noted, the ton miles per mile of line are nearly four and one-half times as great, and the ton miles in proportion to population are over eight times as great.

For Group II the freight revenues per mile of line are one-sixth greater than for Prussia-Hesse. However, the ton miles per mile of line are over twice as great and the ton miles in proportion to population nearly five times as great.

These comparisons would indicate that the average receipts per ton mile are lower in the United States than in either France or Prussia-Hesse, and this we find to be the case. For Group II the average receipts per ton per mile are .65 cents, that is, six and five-tenths mills; for France they are 1.21 cents, and for Prussia-Hesse 1.24 cents. The average receipts per ton mile for the one railway of England that compiles such statistics are 2.30 cents, but this includes collection and delivery of certain high class traffic. Because of the varying transportation conditions in the countries compared, the average receipts per ton mile must not be accepted as an absolute proof of the relative height of freight rates in Europe and the United States.

A similar analysis of the passenger traffic and the passenger revenues shows a different condition.

Passenger revenues per mile of line.	In 1909.	Compared with 1900.
Group II	$4,884	increased 34.2 per cent
United Kingdom	10,704	increased 5.9 "
France	4,418	increased 4.1 "
Prussia-Hesse	5,741	increased 24.3 "
United States	2,395	increased 42.5 "

For Group II the passenger revenues per mile of line are less than half of those of the United Kingdom. It should be noted, however, that the English returns of passenger revenues cover all passenger train traffic, and include receipts from baggage, mail, and the like.

For Group II the passenger revenues are about ten per cent greater per mile of line than for France. The passenger miles per mile of line are over one-third greater in France, while the passenger miles per inhabitant are only about two-thirds of those of Group II.

For Group II the passenger revenues per mile of line are about six-sevenths of those of Prussia-Hesse. The passenger miles per mile of line are less than one-half those of Prussia-Hesse and the passenger miles are about five per cent less per inhabitant.

The average receipts per passenger mile in Group II are 1.7 cents, in France 1.11 cents, and in Prussia-Hesse .94 cents, in the United States as a whole 1.93 cents.

Operating expenses per mile of line.	In 1909.	Compared with 1900.
Group II	$14,674	increased 38.0 per cent
United Kingdom	14,833	increased 7.9 "
France	7,765	increased 15.6 "
Prussia-Hesse	14,527	increased 40.1 "
United States	6,851	increased 37.2 "

These operating expenses for the different countries are not exactly comparable because they are not in all respects similarly constituted. For example, in Prussia-Hesse rentals and certain other items are included in operating expenses that in the United States are charged to other accounts.

Although in the United Kingdom there were nearly twice as many train miles per mile of line as in Group II, the operating expenses per mile of line for Group II are only fractionally less.

Although the train miles per mile of line in France are virtually the same as in Group II, the operating expenses for Group II per mile of line are nearly twice as great.

The operating expenses per mile of line for Group II are substantially the same as for Prussia-Hesse, although the train miles per mile of line are a fifth less.

Net operating revenue per mile of line.	In 1909.	Compared with 1900.
Group II	$7,347	increased 25.0 per cent
United Kingdom	8,302	increased .4 "
France	5,641	*decreased .1* "
Prussia-Hesse	6,529	*decreased 7.6* "
United States	3,505	increased 28.4 "

As the operating revenues and the operating expenses are not exactly comparable, it follows that the net operating revenues can not be closely compared. The results in one country for one year are of course comparable with the results in the same country for another year.

In Group II the increase has been 25.0 per cent, while the ton miles per mile of line have increased 29 per cent and the passenger miles per mile of line 42.9 per cent.

In France there has been a decrease of one-tenth of one per cent in net revenue per mile, while the ton miles per mile of line have increased 18.0 per cent, and the passenger miles per mile of line 8.1 per cent.

In Prussia-Hesse there has been a decrease of 7.6 per cent in net revenue per mile, while the ton miles have increased 20.3 per cent.

TABLES

TABULAR COMPARISON OF RAILWAY STATISTICS

The United States, The United States—Group II, The United Kingdom, France, Prussia-Hesse†

Subject for Comparison	1900	1905	1908	1909
Area in square miles—				
United States, Group II	107,873	107,873	107,873	107,873
United Kingdom	121,371	121,371	121,371	121,371
France	204,321	204,321	207,075	.....
Prussia-Hesse	137,547	137,567	137,572	137,572
United States, All groups	2,970,230	2,970,230	2,970,230	2,970,230
Population—				
United States, Group II	16,159,438	18,078,437	19,229,836	19,613,636
Per cent increase over 1900		*11.9*	*19.0*	*21.4*
United Kingdom	41,155,000	43,221,000	44,547,000	45,006,000
Per cent increase over 1900		*5.0*	*8.2*	*9.4*
France	38,900,000	39,230,000	39,267,000	.....
Per cent increase over 1900		*.8*	*.9*	.....
Prussia-Hesse	35,592,402	38,502,499	40,264,809	40,852,245
Per cent increase over 1900		*8.2*	*13.1*	*14.8*
United States, All groups	75,994,575	83,983,419	88,776,727	90,374,493
Per cent increase over 1900		*10.5*	*16.8*	*18.9*

†Throughout these tables the statistics for the United States, and for the United States, Group II, for 1900 and 1905, are based upon returns that include those of switching and terminal companies, for 1908 and 1909 upon returns which do not include those of switching and terminal companies.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Miles of line operated at end of fiscal year, single track—				
United States, Group II	21,717	23,281	23,697	23,887
Per cent increase over 1900		*7.2*	*9.1*	*10.0*
United Kingdom	21,855	22,847	23,205	23,280
Per cent increase over 1900		*4.5*	*6.2*	*6.5*
France	23,639	24,597	24,931	.....
Per cent increase over 1900		*4.1*	*5.5*	.....
Prussia-Hesse	19,102	21,629	22,657	23,154
Per cent increase over 1900		*13.2*	*18.6*	*21.2*
United States, All groups....	192,556	216,974	230,494	235,402
Per cent increase over 1900		*12.7*	*19.7*	*22.3*
Total miles of track—all main tracks—				
United States, Group II	29,084	32,119	33,222	33,558
Per cent increase over 1900		*10.4*	*14.2*	*15.4*
United Kingdom	[a]35,804	38,431	39,316	39,622
Per cent increase over 1900		*7.3*	*9.8*	*10.7*
France	33,650	35,047	35,650	.....
Per cent increase over 1900		*4.2*	*5.9*	.....
Prussia-Hesse	26,911	30,132	32,316	33,133
Per cent increase over 1900		*12.0*	*20.1*	*23.1*
United States, All groups...	206,631	236,855	254,193	259,975
Per cent increase over 1900		*14.6*	*23.0*	*25.8*
Per cent of line having two or more tracks—				
United States, Group II	27.0	29.4	30.9	31.2
United Kingdom	55.6	55.6	55.7	55.8
France	42.3	42.5	43.0	.....
Prussia-Hesse	40.5	38.6	41.8	42.3
United States, All groups ...	6.3	7.9	8.8	8.9

a Partially estimated.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Total miles of line per 100 square miles—				
United States, Group II	20.13	21.58	21.97	22.14
Per cent increase over 1900		*7.2*	*9.1*	*10.0*
United Kingdom	18.01	18.82	19.12	19.18
Per cent increase over 1900		*4.5*	*6.2*	*6.5*
France	11.57	12.04	12.04	.....
Per cent increase over 1900		*4.1*	*4.1*	.....
Prussia-Hesse	13.89	15.72	16.47	16.83
Per cent increase over 1900		*13.2*	*18.6*	*21.2*
United States, All groups...	6.48	7.30	7.76	7.93
Per cent increase over 1900		*12.7*	*19.7*	*22.3*
Total miles of track per 100 square miles—				
United States, Group II	26.96	29.77	30.80	31.11
Per cent increase over 1900		*10.4*	*14.2*	*15.4*
United Kingdom	[a]29.50	31.66	32.39	32.65
Per cent increase over 1900		*7.3*	*9.8*	*10.7*
France	16.47	17.15	17.22	.....
Per cent increase over 1900		*4.2*	*4.6*	.....
Prussia-Hesse	19.56	21.90	23.49	24.08
Per cent increase over 1900		*12.0*	*20.1*	*23.1*
United States, All groups ...	6.96	7.97	8.56	8.75
Per cent increase over 1900		*14.6*	*23.0*	*25.8*
Population per square mile—				
United States, Group II	149.8	167.6	178.3	181.8
Per cent increase over 1900		*11.9*	*19.0*	*21.4*
United Kingdom	339.1	356.1	367.0	370.8
Per cent increase over 1900		*5.0*	*8.2*	*9.4*
France	190.4	192.0	189.6	.....
Per cent increase over 1900		*.8*	**.4*	.....
Prussia-Hesse	258.8	279.9	292.7	297.0
Per cent increase over 1900		*8.2*	*13.1*	*14.8*
United States, All groups ...	25.6	28.3	29.9	30.4
Per cent increase over 1900		*10.5*	*16.8*	*18.9*

a Partially estimated.

*Decrease.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Miles of line per 10,000 inhabitants—				
United States, Group II	13.44	12.88	12.32	12.18
Per cent increase over 1900		**4.2*	**8.3*	**9.4*
United Kingdom	5.31	5.29	5.21	5.17
Per cent increase over 1900		**.4*	**1.9*	**2.6*
France	6.08	6.27	6.35	.....
Per cent increase over 1900		*3.1*	*4.4*	.....
Prussia-Hesse	5.37	5.62	5.63	5.67
Per cent increase over 1900		*4.7*	*4.8*	*5.6*
United States, All groups ...	25.34	25.84	25.96	26.05
Per cent increase over 1900		*2.0*	*2.4*	*2.8*
Total miles of track per 10,000 inhabitants—				
United States, Group II	18.00	17.77	17.28	17.11
Per cent increase over 1900		**1.3*	**4.0*	**4.9*
United Kingdom	[a]8.70	8.89	8.83	8.80
Per cent increase over 1900		*2.2*	*1.5*	*1.1*
France	8.65	8.93	9.08	.....
Per cent increase over 1900		*3.2*	*5.0*	.....
Prussia-Hesse	7.56	7.83	8.03	8.11
Per cent increase over 1900		*3.6*	*6.2*	*7.3*
United States, All groups...	27.19	28.20	28.63	28.77
Per cent increase over 1900		*3.7*	*5.3*	*5.8*
Locomotives per 1,000 miles of line—				
United States, Group II	449	507	563	561
Per cent increase over 1900		*12.9*	*25.4*	*24.9*
United Kingdom	970	980	980	980
Per cent increase over 1900		*1.0*	*1.0*	*1.0*
France	443	452	480	.....
Per cent increase over 1900		*2.0*	*8.4*	.....
Prussia-Hesse	674	711	[a]816	[a]838
Per cent increase over 1900		*5.5*	*21.1*	*24.3*
United States, All groups...	195	223	246	243
Per cent increase over 1900		*14.4*	*26.2*	*24.6*

a Partially estimated.

a Includes an appreciable number of motor wagons (Triebwagen).

*Decrease.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Cars (all kinds) per 1,000 miles of line—				
United States, Group II	19,077	20,098	23,028	22,388
Per cent increase over 1900		*5.4*	*20.7*	*17.4*
United Kingdom	35,740	35,750	36,190	36,060
Per cent increase over 1900		*a*	*1.3*	*.9*
France	13,347	13,595	14,704	.....
Per cent increase over 1900		*1.9*	*10.2*	.....
Prussia-Hesse	16,458	16,687	19,332	19,607
Per cent increase over 1900		*1.4*	*17.5*	*19.1*
United States, All groups...	7,535	8,494	9,680	9,423
Per cent increase over 1900		*12.7*	*28.5*	*25.1*
Average capacity of freight car (tons)—				
United States, Group II				
Per cent increase over 1900		.....		
United Kingdom				
Per cent increase over 1900		.....		
France	11.2	12.2	13.0	.....
Per cent increase over 1900		*8.9*	*16.1*	.....
Prussia-Hesse	14.1	14.7	15.3	15.5
Per cent increase over 1900		*4.3*	*8.5*	*9.9*
United States, All groups		31.0	35.0	35.0
Per cent increase over 1905			*12.9*	*12.9*
Average seating capacity of passenger car—				
United States, Group II[a] ...	57	59	62	63
Per cent increase over 1900		*3.5*	*8.8*	*10.5*
United Kingdom				
Per cent increase over 1900		.....		
France				
Per cent increase over 1900		.....		
Prussia-Hesse	46	48	49	49
Per cent increase over 1900		*4.3*	*6.5*	*6.5*
United States, All groups				
Per cent increase over 1900		.....		

a Less than one-tenth of one per cent.

a Pennsylvania Railroad only.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Revenue train miles per mile of line—				
United States, Group II			10,217	9,715
Per cent increase over 1908				**4.9*
United Kingdom	18,397	17,548	18,237	18,009
Per cent increase over 1900		**4.6*	**.9*	**2.1*
France	9,112	8,612	9,317	.....
Per cent increase over 1900		**5.5*	*2.2*	.....
Prussia-Hesse	10,166	11,724	12,489	12,164
Per cent increase over 1900		*15.3*	*22.9*	*19.7*
United States, All groups	4,605	4,786	4,899	4,726
Per cent increase over 1900		*3.9*	*6.4*	*2.6*
Ton miles per mile of line—				
United States, Group II	1,900,578	2,200,372	2,565,154	2,451,841
Per cent increase over 1900		*15.8*	*35.0*	*29.0*
United Kingdom[a]		739,466	808,857	814,713
Per cent increase over 1905			*9.4*	*10.2*
France	478,920	491,955	565,158	.....
Per cent increase over 1900		*2.7*	*18.0*	.....
Prussia-Hesse	889,441	988,157	1,028,503	1,069,743
Per cent increase over 1900		*11.1*	*15.6*	*20.3*
United States, All groups	735,352	861,396	974,654	953,986
Per cent increase over 1900		*17.1*	*32.5*	*29.7*
Average tons per freight train—				
United States, Group II[a]	355	412	464	479
Per cent increase over 1900		*16.1*	*30.7*	*34.9*
United Kingdom[b]		107	116	123
Per cent increase over 1905			*8.4*	*15.0*
France	144	173	177	.....
Per cent increase over 1900		*20.1*	*22.9*	.....
Prussia-Hesse	[a]163	[a]159	210	233
Per cent increase over 1900		**2.5*	*28.8*	*42.9*
United States, All groups[a]	271	322	352	363
Per cent increase over 1900		*18.8*	*29.9*	*34.0*

a Mixed train miles included in divisor.
b North Eastern Railway only.

*Decrease

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Average haul per ton (miles)—				
United States, Group II	110.9	114.6	130.6	130.3
Per cent increase over 1900		*3.3*	*17.8*	*17.5*
United Kingdom[a]		22.7	23.2	23.1
Per cent increase over 1905			*2.2*	*1.8*
France	81.1	79.0	81.0	.....
Per cent increase over 1900		**2.6*	**.1*	.....
Prussia-Hesse	73.1	69.6	69.5	69.0
Per cent increase over 1900		**4.8*	**4.9*	**5.6*
United States, All groups (as a system).....	242.7	237.6	253.9	251.1
Per cent increase over 1900		**2.1*	*4.6*	*3.5*
United States (average railway)	130.9	130.6	143.8	141.9
Per cent increase over 1900		**.2*	*9.9*	*8.4*

a North Eastern Railway only.

Receipts per ton per mile (cents)—				
United States, Group II	.61	.66	.64	.65
Per cent increase over 1900		*8.2*	*4.9*	*6.6*
United Kingdom[a]		2.36	2.31	2.30
Per cent increase over 1905			**2.1*	**2.5*
France	1.32	1.27	1.21	.....
Per cent increase over 1900		**3.8*	**8.3*	.....
Prussia-Hesse[b]	1.24	1.25	1.24	1.24
Per cent increase over 1900		*.8*	*0.0*	*0.0*
United States, All groups...	.73	.77	.75	.76
Per cent increase over 1900		*5.5*	*2.7*	*4.1*

a North Eastern Railway only.

b Excluding receipts from miscellaneous sources (Nebenerträge), for which ton-mileage figures are not given.

Ton miles per inhabitant—				
United States, Group II	2,554	2,826	3,125	2,950
Per cent increase over 1900		*10.7*	*22.4*	*15.5*
United Kingdom				
Per cent increase over 1900				
France	292	309	359	.....
Per cent increase over 1900		*5.8*	*22.9*	.....
Prussia-Hesse	486	555	579	606
Per cent increase over 1900		*14.2*	*19.1*	*24.7*
United States, All groups...	1,863	2,220	2,460	2,421
Per cent increase over 1900		*19.2*	*32.0*	*30.0*

*Decrease.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Passenger miles per mile of line—				
United States, Group II	202,902	255,718	304,163	290,023
Per cent increase over 1900		*26.0*	*49.9*	*42.9*
United Kingdom				
Per cent increase over 1900		.....		
France	369,021	357,574	398,984	.....
Per cent increase over 1900		**3.1*	*8.1*	.....
Prussia-Hesse			627,032	675,023
Per cent increase over 1908				*7.7*
United States, All groups ...	83,290	109,949	130,073	127,299
Per cent increase over 1900		*32.0*	*56.2*	*52.8*
Average passengers per train—				
United States, Group II[a] ...	47	55	62	60
Per cent increase over 1900		*17.0*	*31.9*	*27.7*
United Kingdom				
Per cent increase over 1900		.....		
France	64	62	65	.....
Per cent increase over 1900		**3.1*	*1.6*	.....
Prussia-Hesse	[a]80	[a]78	79	85
Per cent increase over 1900		**2.5*	**1.2*	*6.3*
United States, All groups[a] ..	41	48	54	54
Per cent increase over 1900		*17.1*	*31.7*	*31.7*
Average journey per passenger (miles)—				
United States, Group II	20.7	21.6	23.0	22.8
Per cent increase over 1900		*4.3*	*11.1*	*10.1*
United Kingdom,.....				
Per cent increase over 1900		.....		
France	19.3	19.8	20.8	.....
Per cent increase over 1900		*2.6*	*7.8*	.....
Prussia-Hesse	15.0	14.6	14.3	14.4
Per cent increase over 1900		**2.7*	**4.7*	**4.0*
United States, All groups...	27.8	32.2	32.9	32.8
Per cent increase over 1900		*15.8*	*18.3*	*18.0*

a Mixed train miles included in divisor.

*Decrease.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Receipts per passenger per mile (cents)—				
United States, Group II	1.79	1.72	1.69	1.70
Per cent increase over 1900		**3.9*	**5.6*	**5.0*
United Kingdom				
Per cent increase over 1900				
France	1.16	1.15	1.11	.....
Per cent increase over 1900		**.9*	**4.3*	.....
Prussia-Hesse	1.01	.95	.90	.94
Per cent increase over 1900		**5.9*	**10.9*	**6.9*
United States, All groups...	2.00	1.96	1.94	1.93
Per cent increase over 1900		**2.0*	**3.0*	**3.5*
Passenger miles per inhabitant—				
United States, Group II	272.7	328.5	368.1	347.5
Per cent increase over 1900		*20.5*	*35.0*	*27.4*
United Kingdom				
Per cent increase over 1900				
France	224.6	224.3	253.7	.....
Per cent increase over 1900		**.1*	*13.0*	.....
Prussia-Hesse	244.8	299.5	339.5	366.7
Per cent increase over 1900		*22.3*	*38.7*	*49.8*
United States, All groups ...	211.0	283.4	327.6	322.1
Per cent increase over 1900		*34.3*	*55.3*	*52.7*
Average trips per inhabitant—				
United States, Group II	13.2	15.2	16.2	15.5
Per cent increase over 1900		*15.2*	*22.7*	*17.4*
United Kingdom[a]	27.8	27.7	28.7	28.1
Per cent increase over 1900		**.4*	*3.2*	*1.1*
France	11.7	11.3	12.2	.....
Per cent increase over 1900		**3.4*	*4.3*	.....
Prussia-Hesse	16.3	20.4	23.7	25.4
Per cent increase over 1900		*25.2*	*45.4*	*55.8*
United States, All groups...	7.6	8.8	10.0	9.9
Per cent increase over 1900		*15.8*	*31.6*	*30.3*

a Excludes trips on season and periodical tickets.

*Decrease.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Capitalization per mile of line—				
United States, Group II				
Per cent increase over 1900				
United Kingdom	$261,863	$271,069	$274,842	$274,766
Per cent increase over 1900		*3.5*	*5.0*	*4.9*
France[a]	133,583	138,053	141,301	
Per cent increase over 1900		*3.4*	*5.8*	
Prussia-Hesse	98,050	100,062	108,293	110,727
Per cent increase over 1900		*2.1*	*10.4*	*12.9*
United States, All groups[b]			57,201	59,259
Per cent increase over 1908				*3.6*
Total revenue per revenue train mile—				
United States, Group II			$2.24	$2.26
Per cent increase over 1908				*.9*
United Kingdom	$1.20	$1.28	1.27	1.28
Per cent increase over 1900		*6.7*	*5.8*	*6.7*
France	1.35	1.43	1.43	
Per cent increase over 1900		*5.9*	*5.9*	
Prussia-Hesse	1.60	1.52	1.50	1.61
Per cent increase over 1900		**5.0*	**6.2*	*.6*
United States, All groups	1.66	1.98	2.11	2.17
Per cent increase over 1900		*19.3*	*27.1*	*30.7*
Ratio of passenger to total revenues (per cent)—				
United States, Group II	22.0	21.7	22.4	22.2
United Kingdom	38.5	38.3	38.5	37.9
France[a]	34.3	33.0	32.9	
Prussia-Hesse	27.6	27.5	28.2	28.6
United States, All groups	21.8	22.7	23.7	23.3

a "Cost of construction." *b* Net capitalization.

a "Grande Vitesse" train revenues, which correspond roughly to passenger service train revenue in the United States.

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*Decrease.

TABULAR COMPARISON OF RAILWAY STATISTICS

(CONTINUED)

	1900	1905	1908	1909
Operating revenues per mile of line[a] —				
United States, Group II	$16,514	$20,752	$22,915	$22,021
Per cent increase over 1900		*25.7*	*38.8*	*33.3*
United Kingdom	22,011	22,391	23,184	23,135
Per cent increase over 1900		*1.7*	*5.3*	*5.1*
France	12,363	12,364	13,406	.....
Per cent increase over 1900		*b*	*8.4*	.....
Prussia-Hesse	17,440	19,171	20,221	21,056
Per cent increase over 1900		*9.9*	*15.9*	*20.7*
United States, All groups ...	7,722	9,598	10,491	10,356
Per cent increase over 1900		*24.3*	*35.9*	*34.1*

a Figures are not strictly comparable as between the different countries, owing to variations in accounting methods.
b Less than one-tenth of one per cent.

Operating expenses per mile of line[a] —				
United States, Group II	$10,635	$13,671	$15,972	$14,674
Per cent increase over 1900		*28.5*	*50.2*	*38.0*
United Kingdom	13,743	14,157	15,159	14,833
Per cent increase over 1900		*3.0*	*10.3*	*7.9*
France	6,717	6,455	7,765	.....
Per cent increase over 1900		**3.9*	*15.6*	.....
Prussia-Hesse	10,373	11,622	14,621	14,527
Per cent increase over 1900		*12.0*	*41.0*	*40.1*
United States, All groups...	4,993	6,409	7,320	6,851
Per cent increase over 1900		*28.4*	*46.6*	*37.2*

a Figures are not strictly comparable as between the different countries, owing to variations in accounting methods.

Net operating revenue per mile of line[a] —				
United States, Group II	$5,879	$7,081	$6,943	$7,347
Per cent increase over 1900		*20.4*	*18.1*	*25.0*
United Kingdom	8,268	8,234	8,025	8,302
Per cent increase over 1900		** .4*	**2.9*	*.4*
France	5,646	5,909	5,641	.....
Per cent increase over 1900		*4.7*	** .1*	.....
Prussia-Hesse	7,067	7,549	5,600	6,529
Per cent increase over 1900		*6.8*	**20.8*	**7.6*
United States, All groups ...	2,729	3,189	3,171	3,505
Per cent increase over 1900		*16.9*	*16.2*	*28.4*

a Figures are not strictly comparable as between the different countries, owing to variations in accounting methods.

*Decrease.

BULLETINS OF THE BUREAU OF RAILWAY ECONOMICS

(*Continued.*)

14. Summary of Revenues and Expenses of Steam Roads in the United States for April, 1911.

15. The Conflict Between Federal and State Regulation of the Railways.

16. Summary of Revenues and Expenses of Steam Roads in the United States for May, 1911.

17. Railway Wage Increases for the year ending June 30, 1911. Retrenchment in the Railway Labor Force in 1911.

18. Capitalization and Dividends of the Railways of Texas, Year Ending June 30, 1909.

19. Summary of Revenues and Expenses of Steam Roads in the United States for June, 1911.

20. Summary of Revenues and Expenses of Steam Roads in the United States for July, 1911.

21. The Cost of Transportation on the Erie Canal and by Rail.

22. Summary of Revenues and Expenses of Steam Roads in the United States for August, 1911.

23. Analysis of the Accident Statistics of the Interstate Commerce Commission for the Year Ending June 30, 1911.

24. Comparative Railway Statistics of the United States, the United Kingdom, France, and Germany.